# SPEC CPU®2017 Integer Rate Result

Dell Inc.  
(Test Sponsor: Dell Inc)  
PowerEdge R740 (Intel Xeon Silver 4210R, 2.40 GHz)  

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>128</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>133</td>
</tr>
</tbody>
</table>

## CPU2017 License: 55  
Test Sponsor: Dell Inc  
Test Date: Aug-2020  
Hardware Availability: Feb-2020  
Software Availability: Apr-2020  

<table>
<thead>
<tr>
<th>Spec</th>
<th>Test</th>
<th>Power Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_base (128)</td>
<td>128</td>
<td>BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
<tr>
<td>SPECrate®2017_int_peak (133)</td>
<td>133</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Silver 4210R  
- **Max MHz:** 3200  
- **Nominal:** 2400  
- **Enabled:** 20 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:** 13.75 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)  
- **Storage:** 1 x 1.92 TB SATA SSD  
- **Other:** None  

### Software

- **OS:** Red Hat Enterprise Linux 8.1  
  - kernel 4.18.0-147.el8.x86_64  
- **Compiler:** 
  - C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux;  
  - Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux  
- **Parallel:** No  
- **Firmware:** Version 2.8.1 released Jun-2020  
- **File System:** tmpfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:** None  
- **jemalloc memory allocator V5.0.1**  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.
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## SPECrate®2017_int_base = 128

## SPECrate®2017_int_peak = 133

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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Seconds</th>
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<tbody>
<tr>
<td>500.perlbench_r</td>
<td>40</td>
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<td><strong>84.9</strong></td>
<td>747</td>
<td>85.2</td>
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<td>502.gcc_r</td>
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<tr>
<td>505.mcf_r</td>
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<tr>
<td>520.omnetpp_r</td>
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<tr>
<td>531.deepsjeng_r</td>
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<td>548.exchange2_r</td>
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<tr>
<td>557.xz_r</td>
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<td><strong>565</strong></td>
<td><strong>76.5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

### Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux  
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

### 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-ic19.1u1/lib/intel64:/mnt/ramdisk/cpu2017-ic19.1u1/lib/ia32:/mnt/ramdisk/cpu2017-ic19.1u1/je5.0.1-32"`

`MALLOC_CONF = "retain:true"`
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Tested by: Dell Inc.

Test Date: Aug-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
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.
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.:
numactl --interleave=all runcpu <etc>
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk" jemalloc, a general purpose malloc implementation built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5 sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases

Platform Notes

BIOS settings:
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub set to standard
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /mnt/ramdisk/cpu2017-ic19.1u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe6e46a485a0011
running on user-pc.spa.lab Tue Aug  4 06:23:22 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

(Continued on next page)
PowerEdge R740 (Intel Xeon Silver 4210R, 2.40 GHz)

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Platform Notes (Continued)

From /proc/cpuinfo
model name : Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
  2 "physical id"s (chips)
  40 "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 : 10
siblings : 20
physical 0: cores 0 1 2 3 4 8 9 10 11 12
physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              40
On-line CPU(s) list: 0-39
Thread(s) per core:  2
Core(s) per socket:  10
Socket(s):           2
NUMA node(s):        2
Vendor ID:           GenuineIntel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz
Stepping:            7
CPU MHz:             1446.045
CPU max MHz:         3200.0000
CPU min MHz:         1000.0000
BogoMIPS:            4800.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            14080K
NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38
NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39
Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelgbd rdtscp
  lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
  aperfmpref perf pnc plmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
  xtrn pdcm pcdid 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 cdcp 13
  invpcid_single intel_pni ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
  flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
  cmqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
  avx512bw avx512vl xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbm_total

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**SPECrate®2017_int_base = 128**

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---

**Platform Notes (Continued)**

```plaintext
cqm_mbm_local dtherm ida atrn pts pkus ospke avx512_vnni md_clear flush_l1d arch_capabilities
```

```plaintext
/proc/cpuinfo cache data
cache size : 14080 KB
```

From `numactl --hardware`  
WARNING: a numactl 'node' might or might not correspond to a physical chip.

```
available: 2 nodes (0-1)
node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38
node 0 size: 385609 MB
node 0 free: 379076 MB
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
node 1 size: 387041 MB
node 1 free: 382999 MB
node distances:
node 0 1
0: 10 21
1: 21 10
```

From `/proc/meminfo`

```
MemTotal:       791194772 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

From `/etc/*release*/etc/*version*/

```
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga
```

```
uname -a:
Linux user-pc.spa.lab 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 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

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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 prct1 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

run-level 3 Aug 4 06:17 last=5
SPEC is set to: /mnt/ramdisk/cpu2017-ic19.1u1
Filesystem     Type   Size  Used Avail Use% Mounted on
tmpfs          tmpfs  225G  4.4G  221G   2% /mnt/ramdisk
From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.8.1 06/26/2020
Vendor: Dell Inc.
Product: PowerEdge R740xd
Product Family: PowerEdge
Serial: F5BMCS2

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:
19x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C       | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen Build 20200304
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)
------------------------------------------------------------------------------

(Continued on next page)
Compiler Version Notes (Continued)

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------------------------------------------------------------------------------------------------------
| C       | 500.perlbench_r(peak) 557.xz_r(peak) |
-----------------------------------------------------------------------------------------------------------------------------------------------

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen Build 20200304
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) |
-----------------------------------------------------------------------------------------------------------------------------------------------

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------------------------------------------------------------------------------------------------------
| C       | 500.perlbench_r(peak) 557.xz_r(peak) |
-----------------------------------------------------------------------------------------------------------------------------------------------

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
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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) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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C
- 500.perlbench_r(peak) 557.xz_r(peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
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C++
- 520.omnetpp_r(base, peak) 531.xalancbmk_r(base, peak)
- 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Fortran
- 548.exchange2_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
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Base Compiler Invocation

C benchmarks:
- icc

C++ benchmarks:
- icpc

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:**
- m64 -qnextgen -std=c11
- Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- xCORE-AVX512 -O3 -ffast-math -ftlo -mfpmath=sse -funroll-loops
- fuse-ld=gold -qopt-mem-layout-trans=4
- L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
- lqkmalloc

**C++ benchmarks:**
- m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
- Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -ftlo -mfpmath=sse
- funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
- L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
- lqkmalloc

**Fortran benchmarks:**
- m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
- lqkmalloc

#### Peak Compiler Invocation

**C benchmarks:**
- icc

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

**Dell Inc.**  
(Test Sponsor: Dell Inc)  
PowerEdge R740 (Intel Xeon Silver 4210R, 2.40 GHz)  

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>128</td>
<td>133</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Date:** Aug-2020  
**Test Sponsor:** Dell Inc  
**Hardware Availability:** Feb-2020  
**Tested by:** Dell Inc  
**Software Availability:** Apr-2020

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## Peak Compiler Invocation (Continued)

**C++ benchmarks:**  
icpc

**Fortran benchmarks:**  
ifort

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## 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:**  
- 505.mcf_r: `basepeak = yes`

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SPECrates 2017_int_base = 128
SPECrates 2017_int_peak = 133

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Peak Optimization Flags (Continued)

525.x264_r: -m64 -qnextgen -std=c11
-W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -xCORE-AVX512 -flto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/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

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-ic19.1u1-official-linux64_revA.xml

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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 2020-08-04 07:23:21-0400.
Report generated on 2020-09-01 19:16:54 by CPU2017 PDF formatter v6255.
Originally published on 2020-09-01.