Dell Inc. (Test Sponsor: Dell Inc)

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)

SPEC CPU®2017 Integer Rate Result

Test Date: Sep-2020
Hardware Availability: Jul-2020
Software Availability: Apr-2020

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

SPECrater®2017_int_base = 127

SPECrate®2017_int_peak = 132

500.perlbench_r 40
502.gcc_r 40
505.mcf_r 40
520.omnetpp_r 40
523.xalancbmk_r 40
525.x264_r 40
531.deepsjeng_r 40
541.leela_r 40
548.exchange2_r 40
557.xz_r 40

Hardware
CPU Name: Intel Xeon Silver 4210R
Max MHz: 3200
Nominal: 2400
Enabled: 20 cores, 2 chips, 2 threads/core
Orderable: 1, 2
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: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)
Storage: 1 x 480 GB SATA SSD
Other: None

Software
OS: Red Hat Enterprise Linux 8.2
kernel 4.18.0-193.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: 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 set to prefer performance at the cost of additional power usage
SPEC CPU®2017 Integer Rate Result

Dell Inc.
(Test Sponsor: Dell Inc)

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)

SPECrate®2017_int_base = 127
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<td>40</td>
<td>745</td>
<td>85.5</td>
<td>748</td>
<td>85.1</td>
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<td>578</td>
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<td>541.leela_r</td>
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<td>579</td>
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<td>76.3</td>
<td>40</td>
<td>565</td>
<td>76.4</td>
</tr>
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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 = "/home/cpu2017-ic19.1u1/lib/intel64:/home/cpu2017-ic19.1u1/lib/ia32:/home/cpu2017-ic19.1u1/je5.0.1-32"
MALLOC_CONF = "retain:true"
```
**SPEC CPU®2017 Integer Rate Result**

**Dell Inc.**  
(Test Sponsor: Dell Inc)

**PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)**

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<th>SPECrate®2017_int_peak = 132</th>
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<td>Software Availability: Apr-2020</td>
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**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.  
jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  

**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 /home/cpu2017-ic19.1u1/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1be46a485a0011  
running on RHEL-8-2-SUT Wed Sep 2 12:23:02 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

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

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

**Dell Inc.**  
(Test Sponsor: Dell Inc)

**PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)**

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**SPECrate®2017_int_base = 127**

**SPECrate®2017_int_peak = 132**

### Platform Notes (Continued)

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: 2897.538
- 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 pdpe1gb rdtsscp 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 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 cat_l3 cdp_l3 invpcid_single intel_pni ssbd mba ibrs ibpb stibp ibrs_enabled tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 irdt invpcid rdpmc mpx rd_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaveas cqm_llc cqm_occup_llc cqm_mbm_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 : 14080 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a

(Continued on next page)
Platform Notes (Continued)

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: 192045 MB
    node 0 free: 191447 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: 193530 MB
    node 1 free: 192787 MB
    node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
    MemTotal:       394830636 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
    os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.2 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.2"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
      ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

uname --a:
    Linux RHEL-8-2-SUT 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

    itlb_multihit:           KVM: Vulnerable
    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,
Dell Inc.  
(Test Sponsor: Dell Inc)  

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)  

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</tbody>
</table>

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

Platform Notes (Continued)

```plaintext
RSB filling  
Mitigation: Clear CPU buffers; SMT vulnerable
```

run-level 3 Sep 2 12:22 last=5

SPEC is set to: /home/cpu2017-ic19.1u1

```plaintext
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs   392G  7.1G  385G   2% /home
```

From /sys/devices/virtual/dmi/id

```plaintext
BIOS:    Dell Inc. 2.8.1 06/30/2020
Vendor:  Dell Inc.
Product: PowerEdge R540
Product Family: PowerEdge
```

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.

```plaintext
Memory:
1x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
6x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
5x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x Not Specified Not Specified
```

(End of data from sysinfo program)

Memory running at 2400

---

Compiler Version Notes

---

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.

---

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.

---

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

==============================================================================
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  
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 Intel(R) 64 Compiler for applications running on Intel(R) 64, 
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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
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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)  
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
Dell Inc. (Test Sponsor: Dell Inc)

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)

CPU2017 License: 55
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Test Date: Sep-2020
Hardware Availability: Jul-2020
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Compiler Version Notes (Continued)

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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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalanchmk_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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================

Base Compiler Invocation

C benchmarks:
  icc

C++ benchmarks:
  icpc

Fortran benchmarks:
  ifort

Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64

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

Dell Inc.  
(Test Sponsor: Dell Inc)

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)

| SPECrate®2017_int_base = 127 |
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CPU2017 License: 55  
Test Sponsor: Dell Inc  
Tested by: Dell Inc.

Base Portability Flags (Continued)

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 -gnexgen -std=c11  
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs  
-xCORE-AVX512 -O3 -ffast-math -flto -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 -gnexgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries  
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -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

C++ benchmarks:
icpc

(Continued on next page)
**Dell Inc.**  
(Test Sponsor: Dell Inc)

**PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)**

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</table>

**Peak Compiler Invocation (Continued)**

Fortran benchmarks:

```fortran
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`

**Peak Optimization Flags**

C benchmarks:

- `505.mcf_r`: `basepeak = yes`
SPEC CPU®2017 Integer Rate Result

Dell Inc. (Test Sponsor: Dell Inc)

PowerEdge R540 (Intel Xeon Silver 4210R, 2.4 GHz)

SPECrate®2017_int_base = 127
SPECrate®2017_int_peak = 132

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

Test Date: Sep-2020
Hardware Availability: Jul-2020
Software Availability: Apr-2020

Peak Optimization Flags (Continued)

525.x264_r: -m64 -qnexgen -std=c11
-Wl,--plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-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: -Wl,-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.

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