Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

**SPECrate®2017_fp_base = 162**
**SPECrate®2017_fp_peak = 167**

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<tr>
<td>554.roms_r</td>
<td>76.9</td>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Silver 4310T
- **Max MHz:** 3400
- **Nominal:** 2300
- **Enabled:** 20 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **Cache L2:** 1.25 MB I+D on chip per core
- **Cache L3:** 15 MB I+D on chip per core
- **Other:** None
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)
- **Storage:** 225 GB on tmpfs
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.3 (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
- **Firmware:** Version 1.2.1 released May-2021
- **File System:** tmpfs
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 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 Floating Point Rate Result

Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

Dell Inc.

SPECrate®2017_fp_base = 162
SPECrate®2017_fp_peak = 167

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Results Table

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</table>

SPECrate®2017_fp_base = 162
SPECrate®2017_fp_peak = 167

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/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/je5.0.1-64"

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
Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

**SPEC CPU®2017 Floating Point Rate Result**

**SPECrate®2017_fp_base = 162**

**SPECrate®2017_fp_peak = 167**

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

## General Notes (Continued)

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>
```

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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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

**Sysinfo program** /mnt/ramdisk/cpu2017-1.1.5-ic2021.1/bin/sysinfo

Rev: r5583 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2flc

running on localhost.localdomain Thu May 13 20:32:13 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 4310T CPU @ 2.30GHz
  2 "physical id"s (chips)
  40 "processors"
```
SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

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

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 5 6 7 8 9
physical 1: cores 0 1 2 3 4 5 6 7 8 9

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: 106
Model name: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
Stepping: 6
CPU MHz: 1819.820
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 15360K
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 mtrr pge mca cmov
pat pse36 clflush dts 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 xtrp 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_pmm ssbd mba ibrs ibpb stibp ibrs_enabled fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cmip rdt_a avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaves xsaveopt xsave xsetbv1 xsavec cgcm_1lc cgcm_occum_1lc cgcm_mbm_total cgcm_mbm_local split_lock_detect wbnoinvd dtcmm ida arat pln pts avx512vbmi umip pku ospke avx512v bmi2 gfnl vaes vpcmtdq avx512_vnni avx512_bitalg tme avx512_vpconfigtdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 15360 KB

(Continued on next page)
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: 250471 MB
node 0 free: 241528 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: 250937 MB
node 1 free: 256338 MB
node distances:
node   0   1
0:  10  20
1:  20  10

From /proc/meminfo
MemTotal:       527813680 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="8.3 (Ootpa)"
        ID="rhel"
        ID_LIKE="fedora"
        VERSION_ID="8.3"
        PLATFORM_ID="platform:el8"
        PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
        ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
    Linux localhost.localdomain 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 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): Not affected

(Continued on next page)
SPECCPU®2017 Floating Point Rate Result
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Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

SPECrate®2017_fp_base = 162
SPECrate®2017_fp_peak = 167

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Platform Notes (Continued)

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): Not affected

run-level 5 May 13 15:19

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 6.9G 219G 4% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R750xa
Product Family: PowerEdge
Serial: 1234567

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:
16x 002C069D002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.2.1
BIOS Date: 05/06/2021
BIOS Revision: 1.2

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,

(Continued on next page)
Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

SPECrate®2017_fp_base = 162
SPECrate®2017_fp_peak = 167

Compiler Version Notes (Continued)

Version 2021.1 Build 20201113
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==============================================================================
C++    | 508.namd_r(base, peak) 510.parest_r(base, peak)
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++, C    | 511.povray_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++, C    | 511.povray_r(base) 526.blender_r(base, peak)
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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(Continued on next page)
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SPEC CPU®2017 Floating Point Rate Result

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Compiler Version Notes (Continued)

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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.

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.

Fortran, C, Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)

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.

Fortran, C | 521.wrf_r(base, peak) 527.cam4_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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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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Dell Inc.  
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)  

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

SPECrater®2017_fp_base = 162  
SPECrater®2017_fp_peak = 167

Test Date: May-2021  
Hardware Availability: May-2021  
Software Availability: Feb-2021

Base Compiler Invocation

C benchmarks:  
icx

C++ benchmarks:  
icpx

Fortran benchmarks:  
ifort

Benchmarks using both Fortran and C:  
ifort icx

Benchmarks using both C and C++:  
icpx icx

Benchmarks using Fortran, C, and C++:  
icpx icx ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64  
507.cactuBSSN_r: -DSPEC_LP64  
508.namd_r: -DSPEC_LP64  
510.parest_r: -DSPEC_LP64  
511.povray_r: -DSPEC_LP64  
519.lbm_r: -DSPEC_LP64  
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian

Base Optimization Flags

C benchmarks:  
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math  
-fflto -mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4  
-mbranches-within-32B-boundaries -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)
Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrade®2017_fp_base = 162
SPECrade®2017_fp_peak = 167

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

C++ benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

Fortran benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte -auto`
- `-mbranches-within-32B-boundaries -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using both Fortran and C:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo`
- `-no-prec-div -qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles`
- `-mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using both C and C++:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using Fortran, C, and C++:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3`
- `-no-prec-div -qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles`
- `-mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

(Continued on next page)
Peak Compiler Invocation (Continued)

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
511.povray_r: icpc icc
526.blender_r: icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes
544.nab_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-Ofast -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
508.namd_r: basepeak = yes
510.parest_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)
Dell Inc.  
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)  

**SPECrate®2017_fp_base = 162**  
**SPECrate®2017_fp_peak = 167**

**CPU2017 License:** 55  
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**Test Date:** May-2021  
**Tested by:** Dell Inc.  
**Hardware Availability:** May-2021  
**Software Availability:** Feb-2021

**Peak Optimization Flags (Continued)**

Fortran benchmarks:

- 503.bwaves_r: basepeak = yes
- 549.fotonik3d_r: basepeak = yes
- 554.roms_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo  
  -no-prec-div -qopt-prefetch -ffinite-math-only  
  -qopt-multiple-gather-scatter-by-shuffles  
  -qopt-mem-layout-trans=4 -nostandard-realloc-lhs  
  -align array32byte -auto -mbranches-within-32B-boundaries  
  -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:

- 521.wrf_r: basepeak = yes
- 527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

- 511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3  
  -ipo -no-prec-div -qopt-prefetch -ffinite-math-only  
  -qopt-multiple-gather-scatter-by-shuffles  
  -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries  
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
- 526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

- 507.cactuBSSN_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:

Dell Inc.  
PowerEdge R750xa (Intel Xeon Silver 4310T, 2.30 GHz)  

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<th>SPECrate®2017_fp_base = 162</th>
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