## Dell Inc. PowerEdge R750xa (Intel Xeon Silver 4316, 2.30 GHz)

| SPECspeed\textsuperscript{2017\_fp\_base} = 155 |
| SPECspeed\textsuperscript{2017\_fp\_peak} = 158 |

### Hardware

- **CPU Name:** Intel Xeon Silver 4316  
- **Max MHz:** 3400  
- **Nominal:** 3300  
- **Enabled:** 40 cores, 2 chips  
- **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:** 30 MB I+D on chip per chip  
- **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)  
  4.18.0-240.15.1.el8_3.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:** Yes  
- **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.

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed\textsuperscript{2017_fp_base}</th>
<th>SPECspeed\textsuperscript{2017_fp_peak}</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>40</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>40</td>
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<td>145</td>
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<td>40</td>
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<tr>
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**Note:** The results are presented in terms of SPEC\textsuperscript{2017\_fp\_base} and SPEC\textsuperscript{2017\_fp\_peak} values, which are used to measure the performance of floating-point benchmarks. The 'Threads' column indicates the number of threads used for each benchmark.
## Results Table

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<tr>
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### 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:
- KMP_AFFINITY = "granularity=fine,compact"
- 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"
- MALLOCONF = "retain:true"
- OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

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
```

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

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

(Continued on next page)
Dell Inc.  
PowerEdge R750xa (Intel Xeon Silver 4316, 2.30 GHz)  

SPEC CPU®2017 Floating Point Speed Result  

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 155  
SPECspeed®2017_fp_peak = 158

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)

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:  
Logical Processor : Disabled  
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: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on localhost.localdomain Thu May 13 13:26:47 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 4316 CPU @ 2.30GHz  
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 : 20  
siblings : 20  
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19  
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 

From lscpu:  
Architecture: x86_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian

(Continued on next page)
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Platform Notes (Continued)

CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 1
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
Stepping: 6
CPU MHz: 2844.904
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
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

/cache data

cache size : 30720 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: 249434 MB
node 0 free: 240943 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: 249674 MB
node 1 free: 251015 MB
node distances:

(Continued on next page)
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Platform Notes (Continued)

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): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

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

Platform Notes (Continued)

run-level 5 May 13 09:22

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 13G 213G 6% /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 | 619.lbm_s(base, peak) 638.imagick_s(base, 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 | 644.nab_s(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.

(Continued on next page)
Dell Inc.  
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**SPEC** CPU®2017 Floating Point Speed Result  
Copyright 2017-2021 Standard Performance Evaluation Corporation  

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

**Compiler Version Notes (Continued)**

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

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**Compiler Version Notes (Continued)**

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
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.

---

### Base Compiler Invocation

*C benchmarks:*

tcc

*Fortran benchmarks:*

tifort

*Benchmarks using both Fortran and C:*

tifort tcc

*Benchmarks using Fortran, C, and C++:*

ticpc tcc tifort

---

### Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactusBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

---

### Base Optimization Flags

*C benchmarks:*

-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries

(Continued on next page)
**Base Optimization Flags (Continued)**

Fortran benchmarks:
- -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3
- -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
- -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib
- -ljemalloc

Benchmarks using both Fortran and C:
- -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using Fortran, C, and C++:
- -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
- -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

**Peak Compiler Invocation**

C benchmarks (except as noted below):
- icc

644.nab_s: icx

Fortran benchmarks:
- ifort

Benchmarks using both Fortran and C:
- ifort icc

Benchmarks using Fortran, C, and C++:
- icpc icc ifort

**Peak Portability Flags**

Same as Base Portability Flags
Dell Inc. PowerEdge R750xa (Intel Xeon Silver 4316, 2.30 GHz)

**SPECspeed®2017_fp_base** = 155

**SPECspeed®2017_fp_peak** = 158

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**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

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### Peak Optimization Flags

**C benchmarks:**

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
  -flio -mfpmath=sse -funroll-loops -fiopenmp
  -DSPEC_OPENMP -qopt-mem-layout-trans=4
  -fimf-accuracy-bits=14:sqrt
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

**Fortran benchmarks:**

603.bwaves_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
  -DSPEC.Suppress.OpenMP -DSPEC.OpenMP -ipo -xCORE-AVX512
  -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
  -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

**Benchmarks using both Fortran and C:**

621.wrf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
  -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div
  -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
  -DSPEC.Suppress.OpenMP -qopenmp -DSPEC.OpenMP
  -mbranches-within-32B-boundaries -nostandard-realloc-lhs
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

**Benchmarks using Fortran, C, and C++:**

607.cactuBSSN_s: basepeak = yes
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.
PowerEdge R750xa (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 155
SPECspeed®2017_fp_peak = 158

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

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

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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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