### Dell Inc.

**PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)**

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Dell Inc.</th>
<th>CPU2017 License:</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Test Date:</td>
<td>Apr-2021</td>
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<tr>
<td></td>
<td></td>
<td>Hardware Availability:</td>
<td>May-2021</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software Availability:</td>
<td>Feb-2021</td>
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</table>

| SPECspeed®2017_fp_base = 225 | SPECspeed®2017_fp_peak = 227 |

<table>
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<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (225)</th>
<th>SPECspeed®2017_fp_peak (227)</th>
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<tr>
<td>603.bwaves_s 76</td>
<td>290</td>
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<tr>
<td>607.cactuBSSN_s 76</td>
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<tr>
<td>619.lbm_s 76</td>
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<td>621.wrf_s 76</td>
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<td>638.imagick_s 76</td>
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</tr>
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<td>649.fotonik3d_s 76</td>
<td>115</td>
<td>546</td>
</tr>
<tr>
<td>654.roms_s 76</td>
<td>248</td>
<td></td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Platinum 8368
- **Max MHz:** 3400
- **Nominal:** 2400
- **Enabled:** 76 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:** 57 MB I+D on chip per chip
- **Other:** None
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R)
- **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 1.1.2 released Apr-2021
- **System State:** Run level 5 (graphical multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.

jemalloc memory allocator V5.0.1
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.
PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

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

Results Table

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<tr>
<th>Benchmark</th>
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<td>64.6</td>
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</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 225
SPECspeed®2017_fp_peak = 227

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

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
Files system 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

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

Dell Inc.

PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

SPECspeed®2017_fp_base = 225
SPECspeed®2017_fp_peak = 227

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

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 Apr 15 15:27:35 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 8368 CPU @ 2.40GHz
  2 "physical id"s (chips)
  76 "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 : 38
siblings : 38
physical 0: cores 0 1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
physical 1: cores 0 1 2 3 4 5 6 7 8 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

(Continued on next page)
Dell Inc.
PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

SPECSpeed®2017_fp_base = 225
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Platform Notes (Continued)

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 76
On-line CPU(s) list: 0-75
Thread(s) per core: 1
Core(s) per socket: 38
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Platinum 8368 CPU @ 2.40GHz
Stepping: 6
CPU MHz: 1254.748
BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 58368K
NUMA node0 CPU(s):
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,
,60,62,64,66,68,70,72,74
NUMA node1 CPU(s):
1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59,
,61,63,65,67,69,71,73,75
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 rdtscp
lm constant_tsc 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
xtrr pdcm pclid 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_ppin ssbd mba ibrs ibpb stibp ibrs_enabled fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512ifm
clfushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsavesopt xsavex vcetbx
vxsaves cmq_llc cmq_llc cmq_mb_total cmq_mb_local split_lock Detect wbnoinvd
dtherm ida arat pnr avx512vbmi umip pku ospke avx512vbmi2 gfnl vaes vpcmulqdq
avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_lid
arch_capabilities

/proc/cpuinfo cache data
cache size : 58368 KB

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

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.
PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

SPECspeed®2017_fp_base = 225
SPECspeed®2017_fp_peak = 227

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

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

Platform Notes (Continued)

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 40 42 44 46 48 50
52 54 56 58 60 62 64 66 68 70 72 74
node 0 size: 242978 MB
node 0 free: 236352 MB
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
53 55 57 59 61 63 65 67 69 71 73 75
node 1 size: 243629 MB
node 1 free: 255337 MB
node distances:
node 0 1
0: 10 20
1: 20 10

From /proc/meminfo
MemTotal: 527806052 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

From /etc/*release* /etc/*version*
oRelease:
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
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store

(Continued on next page)
Dell Inc.
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Platform Notes (Continued)

Bypass disabled via prctl and seccomp
Mitigation: usercopy/swapsgs barriers and __user pointer sanitization

CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):

Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
Not affected
Not affected

run-level 5 Apr 15 11:28
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-ic2021.1

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R650
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:
7x 00AD00B300AD HMAA4GR7A8R8N-XN 32 GB 2 rank 3200
9x 00AD063200AD HMAA4GR7A8R8N-XN 32 GB 2 rank 3200
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.2
BIOS Date: 04/09/2021
BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

---------------------------------------------------------------------
C | 619.1bm_s(base, peak) 638.imagick_s(base, peak)
   | 644.nab_s(base)
---------------------------------------------------------------------

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)

(Continued on next page)
Dell Inc.
PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

SPECspeed®2017_fp_base = 225
SPECspeed®2017_fp_peak = 227

Compiler Version Notes (Continued)

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<table>
<thead>
<tr>
<th>language</th>
<th>tests (base, peak)</th>
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<tbody>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
<td>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base)</td>
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<tr>
<td>Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
<td>607.cactuBSSN_s(base, peak) 603.bwaves_s(base, peak) 654.roms_s(base, peak)</td>
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<td>Intel(R) FORTRAN Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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SPECspeed®2017_fp_base = 225
SPECspeed®2017_fp_peak = 227

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

## Compiler Version Notes (Continued)

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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---------
Fortran, C 621.wrf_s(base, peak) 627.cam4_s(base, peak)
628.pop2_s(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) 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.

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### Base Compiler Invocation

C benchmarks:
`icc`

Fortran benchmarks:
`ifort`

Benchmarks using both Fortran and C:
`ifort icc`

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

### 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

(Continued on next page)
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Base Portability Flags (Continued)

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

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

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

Benchmarks using Fortran, C, and C++:
```bash
icpc icc ifort
```

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

### C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes


### 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 -gopenmp -nostandard-realloc-lhs -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

649.fotonik3d_s: Same as 603.bwaves_s

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 -gopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs

(Continued on next page)
### Peak Optimization Flags (Continued)

621.wrf_s (continued):
- 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

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:


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

**Dell Inc.**

PowerEdge R650 (Intel Xeon Platinum 8368, 2.40 GHz)

| SPECspeed®2017_fp_base | 225 |
| SPECspeed®2017_fp_peak | 227 |

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Apr-2021

**Tested by:** Dell Inc.

**Hardware Availability:** May-2021

**Software Availability:** Feb-2021

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