## Dell Inc.

### PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 55.9</th>
<th>SPECrate®2017_fp_peak = 60.3</th>
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<tr>
<td>Dell Inc.</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Aug-2021  
**Hardware Availability:** Oct-2021  
**Software Availability:** May-2021  

### Hardware

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<th>SPECrate®2017_fp_peak (60.3)</th>
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### Software

<table>
<thead>
<tr>
<th>OS:</th>
<th>Red Hat Enterprise Linux 8.4 (Ootpa)</th>
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</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>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</td>
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<tr>
<td>Parallel:</td>
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<td>Firmware:</td>
<td>Version 1.0.1 released Aug-2021</td>
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<tr>
<td>File System:</td>
<td>tmpfs</td>
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<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers:</td>
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<tr>
<td>Peak Pointers:</td>
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<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
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<tr>
<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage.</td>
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</table>
SPEC CPU®2017 Floating Point Rate Result

Dell Inc.

PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

SPECrate®2017_fp_base = 55.9

SPECrate®2017_fp_peak = 60.3

Results Table

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</tbody>
</table>

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-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

(Continued on next page)
Dell Inc.  
PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)  

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<td>Hardware Availability: Oct-2021</td>
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</tr>
<tr>
<td>Software Availability: May-2021</td>
<td>Software Availability: May-2021</td>
</tr>
</tbody>
</table>

**General Notes (Continued)**

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

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 70 GB ramdisk created with the cmd: "mount -t tmpfs -o size=70G tmpfs /mnt/ramdisk"

**Platform Notes**

BIOS settings:
Virtualization Technology : Disabled

System Profile : Custom
CPU Power Management : Maximum Performance
C1E : Disabled
C States : Autonomous
PCI ASPM L1 Link
Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d
running on localhost.localdomain Wed Aug 25 02:09:16 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) E-2388G CPU @ 3.20GHz
  1 "physical id"s (chips)
  16 "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 : 8
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7

(Continued on next page)
Dell Inc.

PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

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

---

**Platform Notes (Continued)**

From `lscpu` from `util-linux 2.32.1`:

- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Byte Order:** Little Endian
- **CPU(s):** 16
- **On-line CPU(s) list:** 0-15
- **Thread(s) per core:** 2
- **Core(s) per socket:** 8
- **Socket(s):** 1
- **NUMA node(s):** 1
- **Vendor ID:** GenuineIntel
- **BIOS Vendor ID:** Intel
- **CPU family:** 6
- **Model:** 167
- **Model name:** Intel(R) Xeon(R) E-2388G CPU @ 3.20GHz
- **BIOS Model name:** Intel(R) Xeon(R) E-2388G CPU @ 3.20GHz
- **Stepping:** 1
- **CPU MHz:** 4600.000
- **BogoMIPS:** 6384.00
- **Virtualization:** VT-x
- **L1d cache:** 48K
- **L1l cache:** 32K
- **L2 cache:** 512K
- **L3 cache:** 16384K
- **NUMA node0 CPU(s):** 0-15

**Flags:**

```
    fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid pni pclmulqdq dtes64 monitor ds_cpl vmx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault invpcid_single sbbd ibrs ibpb stibp ibrs_enabled fsgsbase tsc_adjust bmi1 avx2 smep bmi2  erms invpcid mxp avx512f avx512dq rdseed adx smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsavevs dtherm ida arat pln pts avx512v bmi umip pku ospke avx512_vbmi2 gfnl vaes vpcmimglq dq avx512_vnni avx512_vbitalg avx512_vpopcntdq rdpid fsgs md_clear flush_lid arch_capabilities
```

/proc/cpuinfo cache data

```
cache size : 16384 KB
```

From `numactl --hardware`

**WARNING:** a numactl 'node' might or might not correspond to a physical chip.

```
available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 64027 MB
node 0 free: 29408 MB
```

(Continued on next page)
Dell Inc.

PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 55.9
SPECrate®2017_fp_peak = 60.3

Dell Inc.
Dell Inc.

Node distances:
node 0
  0: 10

From /proc/meminfo:
  MemTotal:       65564200 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active:
  No current active profile.

From /etc/*release* /etc/*version*:
  NAME="Red Hat Enterprise Linux"
  VERSION="8.4 (Ootpa)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="8.4"
  PLATFORM_ID="platform:el8"
  PRETTY_NAME="Red Hat Enterprise Linux 8.4 (Ootpa)"
  ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.4:ga

uname -a:
Linux localhost.localdomain 4.18.0-305.el8.x86_64 #1 SMP Thu Apr 29 08:54:30 EDT 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 Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1):
  Mitigation: usercopy/swappgs 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

(Continued on next page)
Dell Inc.  
PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)  

| SPECrate®2017_fp_base = 55.9 | SPECrate®2017_fp_peak = 60.3 |

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

Test Date: Aug-2021  
Hardware Availability: Oct-2021  
Software Availability: May-2021

Platform Notes (Continued)

run-level 3 Aug 24 15:24

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1

Filesystem     Type   Size  Used  Avail  Use%  Mounted on
  tmpfs          tmpfs   70G   29G   42G  41%  /mnt/ramdisk

From /sys/devices/virtual/dmi/id
  Vendor:         Dell Inc.
  Product:        PowerEdge R350
  Product Family: PowerEdge
  Serial:         7SWJFF3

Additional information from dmidecode 3.2 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:
  2x 002C00000C01 18ASF4G72AZ-3G2B1 32 GB  2 rank 3200

BIOS:
  BIOS Vendor:       Dell Inc.
  BIOS Version:      1.0.1
  BIOS Date:         08/18/2021
  BIOS Revision:     1.0

(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,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================

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.
==============================================================================

(Continued on next page)
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PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

CPU2017 License: 55
Test Sponsor: Dell Inc.
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SPECrates

SPECrates\textsuperscript{\textregistered 2017}_{\textsubscript{fp\_base}} = 55.9

SPECrates\textsuperscript{\textregistered 2017}_{\textsubscript{fp\_peak}} = 60.3

Test Date: Aug-2021
Hardware Availability: Oct-2021
Software Availability: May-2021

Compiler Version Notes (Continued)

==============================================================================
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.
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.
------------------------------------------------------------------------------

Compiler Version Notes (Continued)

==============================================================================
C++, C          | 511.povray\_r(base) 526.blender\_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.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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Compiler Version Notes (Continued)

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C++, C          | 511.povray\_r(peak)
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Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
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Compiler Version Notes (Continued)

==============================================================================
C++, C, Fortran | 507.cactuBSSN\_r(base, peak)
------------------------------------------------------------------------------
(Continued on next page)
Compiler Version Notes (Continued)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
================================================================================

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================================================================================
Fortran, C | 521.wrf_r(peak)
================================================================================

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================================================================================
Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)
================================================================================

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================================================================================
Fortran, C | 521.wrf_r(peak)
================================================================================

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(Continued on next page)
Dell Inc.

PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

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

Test Date: Aug-2021
Hardware Availability: Oct-2021
Software Availability: May-2021

Compiler Version Notes (Continued)

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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
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==============================================================================
Fortran, C      | 521.wrf_r(base) 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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Version 2021.1 Build 20201113
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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.cactusBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64

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

Dell Inc.
PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

SPECrate®2017_fp_base = 55.9
SPECrate®2017_fp_peak = 60.3

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

Test Date: Aug-2021
Hardware Availability: Oct-2021
Software Availability: May-2021

Base Portability Flags (Continued)

511.povray_r: -DSPEC_LP64
519.ibm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -fuunsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -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

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

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

Benchmarks using both C and C++ (continued):
- `L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using Fortran, C, and C++:
- `-W-m64 -std=gnu11 -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`

Fortran benchmarks:
- `ifort`

Benchmarks using both Fortran and C:
- `521.wrf_r:ifort icc`
- `527.cam4_r: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
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

Fortran benchmarks:

503.bwaves_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

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

521.wrf_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
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes
Dell Inc.

PowerEdge R350 (Intel Xeon E-2388G, 3.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 55.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak = 60.3</td>
</tr>
</tbody>
</table>

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

Test Date: Aug-2021
Hardware Availability: Oct-2021
Software Availability: May-2021

Peak Optimization Flags (Continued)

Benchmarks using both C and C++:


- 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:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.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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