## SPEC CPU®2017 Floating Point Rate Result

**Dell Inc.**

**PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)**

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 27.4</th>
<th>SPECrate®2017_fp_peak = 27.9</th>
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<td>Hardware Availability: Dec-2019</td>
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<tr>
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<td>Software Availability: Jun-2019</td>
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### Hardware

- **CPU Name**: Intel Core i3-9100
- **Max MHz**: 4200
- **Nominal**: 3600
- **Enabled**: 4 cores, 1 chip
- **Orderable**: 1 chip
- **Cache L1**: 32 KB I + 32 KB D on chip per core
- **Cache L2**: 256 KB I+D on chip per core
- **Cache L3**: 6 MB I+D on chip per core
- **Other**: None
- **Memory**: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-R)
- **Storage**: 1 x 960 GB SATA SSD
- **Other**: None

### Software

- **OS**: SUSE Linux Enterprise Server 15 SP1
- **Compiler**: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux;
  Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- **Parallel**: No
- **Firmware**: Version 2.1.6 released Nov-2019
- **File System**: xfs
- **System State**: Run level 3 (multi-user)
- **Base Pointers**: 64-bit
- **Peak Pointers**: 64-bit
- **Other**: None
- **Power Management**: BIOS set to prefer performance at the cost of additional power usage.

### Specbench Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<th>SPECrate®2017_fp_peak (27.9)</th>
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<td>24.2</td>
<td>67.5</td>
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<tr>
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<td>4</td>
<td>24.3</td>
<td>67.5</td>
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<tr>
<td>508.namd_r</td>
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<td>20.8</td>
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<tr>
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<td>70.3</td>
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<td>538.imagick_r</td>
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<td>30.1</td>
<td>70.3</td>
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<td>544.nab_r</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>554.roms_r</td>
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Note: The results are based on the SPEC CPU®2017 benchmark suite.
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Dell Inc.
PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)

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Results Table

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<th>Peak Copies</th>
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<td>12.7</td>
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<td>488</td>
<td>13.0</td>
</tr>
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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 = "/home/cpu2017/lib/intel64"

General Notes

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5

Yes: 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.

(Continued on next page)
General Notes (Continued)

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.
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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

Platform Notes

BIOS settings:
Virtualization Technology disabled
DCU Streamer Prefetcher 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 disabled
PCI ASPM L1 Link Power Management disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl6e46a485a0011
running on linux-g3ob Thu Nov 21 18:17:34 2019

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) Core(TM) i3-9100 CPU @ 3.60GHz
  1 "physical id"s (chips)
  4 "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 : 4
siblings : 4
physical 0: cores 0 1 2 3

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
Dell Inc.

PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)

SPECratenet®2017_fp_base = 27.4
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

CPU(s): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Core(TM) i3-9100 CPU @ 3.60GHz
Stepping: 11
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 6144K
NUMA node0 CPU(s): 0-3
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 aperf perfctr tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx est tm2 ssse3 sdbg fma cx16 xpr pdcm pccd scod sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx fl64c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vmx flexpriority ept vpid fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mxp rds ed cxflushopt intel_pt xsaveopt xsavec xgetbvl x save dts dtherm ida arat pln pts md_clear flush_lid

From /proc/cpuinfo cache data
cache size: 6144 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
node 0 size: 64259 MB
node 0 free: 62770 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 65801564 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

(Continued on next page)
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PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)

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**Platform Notes (Continued)**

From `/etc/*release* /etc/*version*`

```
oS-release:
  NAME="SLES"
  VERSION="15-SP1"
  VERSION_ID="15.1"
  PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
  ID="sles"
  ID_LIKE="suse"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:15:sp1"
```

**uname -a**:

```
Linux linux-g3ob 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux
```

**Kernel self-reported vulnerability status:**

- **CVE-2018-3620 (L1 Terminal Fault):** Mitigation: PTE Inversion
- **Microarchitectural Data Sampling:** Mitigation: Clear CPU buffers; SMT disabled
- **CVE-2017-5754 (Meltdown):** Mitigation: PTI
- **CVE-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: __user pointer sanitization
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

**run-level 3 Nov 21 15:17 last=5**

**SPEC is set to:** `/home/cpu2017`

```
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      xfs   440G   34G  407G   8% /
```

From `/sys/devices/virtual/dmi/id`

```
BIOS: Dell Inc. 2.1.6 09/27/2018
Vendor: Dell Inc.
Product: PowerEdge R240
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.

**Memory:**

```
2x 00AD000000A02 HMA82GU7CJR8N-VK 16 GB 2 rank 2666
2x 00AD000000A06 HMA82GU7CJR8N-VK 16 GB 2 rank 2666
```

(Continued on next page)
Dell Inc.
PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)

SPECrate®2017_fp_base = 27.4
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CPU2017 License: 55
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Tested by: Dell Inc.

Test Date: Nov-2019
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Platform Notes (Continued)
(End of data from sysinfo program)

Compiler Version Notes

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<td>C</td>
<td>519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)</td>
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<td>Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.4.227 Build 20190416</td>
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### Base Compiler Invocation

**C benchmarks:**

```bash
icc -m64 -std=c11
```

**C++ benchmarks:**

```bash
icpc -m64
```

**Fortran benchmarks:**

```bash
ifort -m64
```

**Benchmarks using both Fortran and C:**

```bash
ifort -m64 icc -m64 -std=c11
```

**Benchmarks using both C and C++:**

```bash
icpc -m64 icc -m64 -std=c11
```

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

```bash
icpc -m64 icc -m64 -std=c11 ifort -m64
```

### Base Portability Flags

503.bwaves_r: -DSPEC_LP64

(Continued on next page)
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PowerEdge R240 (Intel Core i3-9100, 3.60 GHz)  

| SPECrate®2017_fp_base | 27.4 |
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### Base Portability Flags (Continued)

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  
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-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:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

**C++ benchmarks:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

**Fortran benchmarks:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs -align array32byte

**Benchmarks using both Fortran and C:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs -align array32byte

**Benchmarks using both C and C++:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

**Benchmarks using Fortran, C, and C++:**
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs -align array32byte
POWEREDGE R240 (Intel Core i3-9100, 3.60 GHz)

SPECrate®2017_fp_base = 27.4
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Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
544.nab_r: Same as 538.imagick_r

C++ benchmarks:
508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
**SPEC CPU®2017 Floating Point Rate Result**

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<th>CPU2017 License:</th>
<th>55</th>
<th>Test Date:</th>
<th>Nov-2019</th>
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<td>Dell Inc.</td>
<td>Hardware Availability:</td>
<td>Dec-2019</td>
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<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Software Availability:</td>
<td>Jun-2019</td>
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### Peak Optimization Flags (Continued)

- **510.parest_r**: 
  
  ```
  -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch 
  -ffinite-math-only -qopt-mem-layout-trans=4
  ```

  Fortran benchmarks:

- **503.bwaves_r**: 
  
  ```
  -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch 
  -ffinite-math-only -qopt-mem-layout-trans=4 -auto 
  -nostandard-realloc-lhs -align array32byte
  ```

- **549.fotonik3d_r**: Same as 503.bwaves_r

- **554.roms_r**: 
  
  ```
  -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 
  -no-prec-div -qopt-prefetch -ffinite-math-only 
  -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs 
  -align array32byte
  ```

  Benchmarks using both Fortran and C:

- **511.povray_r**: 
  
  ```
  -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 
  -no-prec-div -qopt-prefetch -ffinite-math-only 
  -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs 
  -align array32byte
  ```

  Benchmarks using both C and C++:

- **526.blender_r**: 
  
  ```
  -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch 
  -ffinite-math-only -qopt-mem-layout-trans=4
  ```

  Benchmarks using Fortran, C, and C++:

- **554.roms_r**: 
  
  ```
  -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 
  -no-prec-div -qopt-prefetch -ffinite-math-only 
  -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs 
  -align array32byte
  ```

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 R240 (Intel Core i3-9100, 3.60 GHz)

SPECrate®2017_fp_base = 27.4
SPECrate®2017_fp_peak = 27.9

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

Test Date: Nov-2019
Hardware Availability: Dec-2019
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