## SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

**PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)**

<table>
<thead>
<tr>
<th>Test Sponsor: Dell Inc.</th>
<th>CPU2017 License: 55</th>
<th>Test Date: Jul-2020</th>
</tr>
</thead>
<tbody>
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<td>Tested by: Dell Inc.</td>
<td>Hardware Availability: Jul-2020</td>
<td></td>
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<td></td>
<td>Software Availability: Apr-2020</td>
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</table>

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>151</td>
<td>153</td>
</tr>
</tbody>
</table>

### Software
- **OS:** Red Hat Enterprise Linux 8.1
- **Kernel:** 4.18.0-147.el8.x86_64
- **Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.7.3 released Mar-2020
- **File System:** tmpfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Hardware
- **CPU Name:** Intel Xeon Gold 6248R
- **Max MHz:** 4000
- **Nominal:** 3000
- **Enabled:** 48 cores, 2 chips
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 1 MB I+D on chip per core
- **L3:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (10 x 32 GB 2Rx4 PC4-2933Y-R; 2 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)
- **Storage:** 1 x 1.92 TB SATA SSD
- **Other:** None

### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>48</td>
<td>182</td>
</tr>
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<td>607.cactuBSSN_s</td>
<td>48</td>
<td>98.9</td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>48</td>
<td>130</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>48</td>
<td>114</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>48</td>
<td>67.1</td>
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<tr>
<td>628.pop2_s</td>
<td>48</td>
<td>159</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>48</td>
<td>87.6</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>48</td>
<td>294</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>48</td>
<td>88.4</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>48</td>
<td>164</td>
</tr>
</tbody>
</table>

Legend:
- **SPECspeed®2017_fp_base:** 151
- **SPECspeed®2017_fp_peak:** 153

---

**Software Management: BIOS set to prefer performance at the cost of additional power usage.**
SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

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Test Sponsor: Dell Inc.
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SPECspeed®2017_fp_base = 151
SPECspeed®2017_fp_peak = 153

Test Date: Jul-2020
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## Results Table

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<th>Ratio</th>
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<td>519</td>
<td>116</td>
<td>509</td>
<td>118</td>
<td>501</td>
<td>48</td>
<td>114</td>
<td>517</td>
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<td>48</td>
<td>91.4</td>
<td>182</td>
<td>90.9</td>
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<td>93.5</td>
<td>178</td>
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<tr>
<td>619.lbm_s</td>
<td>48</td>
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<td>98.9</td>
<td>52.2</td>
<td>100</td>
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<td>53.0</td>
<td>98.9</td>
<td>52.2</td>
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<tr>
<td>621.wrf_s</td>
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<td>130</td>
<td>102</td>
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<td>102</td>
<td>130</td>
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<td>96.3</td>
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<td>114</td>
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<td>160</td>
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<td>59.5</td>
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<td>164</td>
<td>95.5</td>
</tr>
</tbody>
</table>

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 = "/dev/shm/cpu2017-ic19.1u1/lib/intel64:/dev/shm/cpu2017-ic19.1u1/je5.0.1-64"
- MALLOC_CONF = "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
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.
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

(Continued on next page)
### Dell Inc.  
**PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)**

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### General Notes (Continued)


### Platform Notes

BIOS settings:
- Virtualization Technology 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 set to standard
- Logical Processor disabled
- CPU Interconnect Bus Link Power Management disabled
- PCI ASPM L1 Link Power Management disabled
- UPI Prefetch disabled
- LLC Prefetch disabled
- Dead Line LLC Alloc enabled
- Directory AtoS disabled

Sysinfo program /dev/shm/cpu2017-ic19.1ul1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a486a0011
running on localhost.localdomain Sat Jul  4 00:41:09 2020

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) Gold 6248R CPU @ 3.00GHz
- 2 "physical id"s (chips)
- 48 "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: 24
  - siblings: 24
  - physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
  - physical 1: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

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

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

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Platform Notes (Continued)

Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6248R CPU @ 3.00GHz
Stepping: 7
CPU MHz: 3677.796
CPU max MHz: 4000.0000
CPU min MHz: 1200.0000
BogoMIPS: 6000.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
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
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
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
   aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
   xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
   avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3
   invpcid_single intel_puin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vni
   flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ibrm invvpids rtm
   cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
   avx512bw avx512vl xsavesopt xsaveopt xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
   cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
   arch_capabilities

/proc/cpuinfo cache data
   cache size : 36608 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 40 42 44 46
   node 0 size: 192072 MB
   node 0 free: 182409 MB

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

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Platform Notes (Continued)
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
node 1 size: 193505 MB
node 1 free: 186128 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal:       394831408 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
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/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Jul 3 22:49

SPEC is set to: /dev/shm/cpu2017-ic19.1u1

Filesystem Type Size Used Avail Use% Mounted on

(Continued on next page)
Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)  

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

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**Platform Notes (Continued)**

| tmpfs | tmpfs 189G 11G 178G  6% /dev/shm |

From /sys/devices/virtual/dmi/id

- BIOS: Dell Inc. 2.7.3 03/25/2020
- Vendor: Dell Inc.
- Product: PowerEdge C6420
- 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:
- 6x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 2x 00AD063200AD HMA84GR7CJR4N-XN 32 GB 2 rank 3200
- 3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 4x Not Specified Not Specified

(End of data from sysinfo program)

---

**Compiler Version Notes**

```
C                      | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
-----------------------|--------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

```
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
-----------------------|------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

(Continued on next page)
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**Compiler Version Notes (Continued)**

Fortran

| 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak) |

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Fortran, C

| 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak) |

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

**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.cactuBSSN_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

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

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:

```bash
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries
```

Fortran benchmarks:

```bash
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -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:

```bash
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -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++:

```bash
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -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:

```bash
icc
```

### Fortran benchmarks:

```bash
ifort
```

### Benchmarks using both Fortran and C:

```bash
ifort icc
```
Dell Inc.

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Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
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
644.nab_s: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP
-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-AVX2
-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-AVX2 -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
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6248R, 3.00 GHz)

| SPECspeed®2017_fp_base = 151 |
| SPECspeed®2017_fp_peak = 153 |

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Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Jul-2020
Hardware Availability: Jul-2020
Software Availability: Apr-2020

Peak Optimization Flags (Continued)

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:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml

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