Dell Inc. PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz) SPECspeed2017_fp_base = 130
SPECspeed2017_fp_peak = 131

<table>
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<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tbody>
<tr>
<td>130</td>
<td>131</td>
</tr>
</tbody>
</table>

Threads

| Thread      | 0 | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 320 | 340 | 360 | 380 | 400 | 420 | 440 | 460 | 480 | 500 |
|-------------|---|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s| 44|    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 607.cactuBSSN_s| 44|    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     | 144 |     |     |     |     |     |     |     |
| 619.lbm_s    | 44|    |    | 91.3|    | 91.6| 92.0|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 621.wrf_s    | 44|    |    | 120|    | 125| 128|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 627.cam4_s   | 44|    |    | 96.0|    | 96.3| 96.7|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 628.pop2_s   | 44|    |    | 64.1|    | 64.7| 65.0|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 638.imagick_s| 44|    |    |    |     | 122| 123|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 644.nab_s    | 44|    |    |    |     | 228| 229|    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 649.fotonik3d_s| 44|    | 80.5|    | 81.8|    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 654.roms_s   | 44|    |    | 133|    |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

**Hardware**

- **CPU Name:** Intel Xeon Gold 6238
- **Max MHz.:** 3700
- **Nominal:** 2100
- **Enabled:** 44 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:** 30.25 MB I+D on chip per chip
- **Other:** None
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
- **Storage:** 1 x 1.6 TB NVMe SSD
- **Other:** None

**Software**

- **OS:** Ubuntu 18.04.2 LTS, kernel 4.15.0-45-generic
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
- **Parallel:** Yes
- **Firmware:** Version 2.1.7 released Apr-2019
- **File System:** ext4
- **System State:** Run level 5 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz)

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

SPECspeed2017_fp_base = 130
SPECspeed2017_fp_peak = 131

Results Table

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<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>603.bwaves_s</td>
<td>44</td>
<td>124</td>
<td>477</td>
<td>123</td>
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<td>115</td>
<td>145</td>
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<td>628.pop2_s</td>
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</tbody>
</table>

SPECspeed2017_fp_base = 130
SPECspeed2017_fp_peak = 131

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"

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-7900X 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.
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

Platform Notes

BIOS settings:
ADDDC setting disabled
Sub NUMA Cluster disabled

(Continued on next page)
Platform Notes (Continued)

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
Logical Processor disabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on intel-sut Tue Apr 9 17:30:42 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) Xeon(R) Gold 6238 CPU @ 2.10GHz
  2 "physical id"s (chips)
  44 "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 : 22
siblings : 22
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 44
On-line CPU(s) list: 0-43
Thread(s) per core: 1
Core(s) per socket: 22
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6238 CPU @ 2.10GHz
Stepping: 7
CPU MHz: 3511.472
**SPEC CPU2017 Floating Point Speed Result**

**Dell Inc.**

PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz)

---

**SPECspeed2017_fp_base** = 130

**SPECspeed2017_fp_peak** = 131

---

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Apr-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Jan-2019

---

**Platform Notes (Continued)**

- **BogoMIPS:** 4200.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 30976K
- **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
- **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
- **Flags:** fpu vme de pse tsc msr pae mca 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** art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
- **aperf** mpnplmdq dtes64 monitor ds cpl vmx smx est tm2 ssse3 sdbg fma cx16
- **xtpr** pdcm pcmd cca ses4_1 ses4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
- **lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust
- **bmi1 hle avx2 smep bmi2 erms invpcid rtm cmq mpx rdt_a avx512f avx512dq rdseed adx
- **smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
- **xsaves cmq_llc cmq_occurs_llc cmq_mbb_total cmq_mbb_local dtherm ida arat pln pts pku
- **ospke avx512_vnni flush_lid arch_capabilities**

/proc/cpuinfo cache data

- **cache size:** 30976 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
- **node 0 size:** 191935 MB
- **node 0 free:** 189238 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
- **node 1 size:** 193509 MB
- **node 1 free:** 188179 MB
- **node distances:**
  - **node 0:** 10 21
  - **node 1:** 21 10

From /proc/meminfo

- **MemTotal:** 394695840 KB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 KB

From /usr/bin/lsb_release -d

- Ubuntu 18.04.2 LTS

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

- **debian_version:** buster/sid

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Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz)

SPECspeed2017_fp_base = 130
SPECspeed2017_fp_peak = 131

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

Test Date: Apr-2019
Hardware Availability: Apr-2019
Software Availability: Jan-2019

Platform Notes (Continued)

os-release:
  NAME="Ubuntu"
  VERSION="18.04.2 LTS (Bionic Beaver)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 18.04.2 LTS"
  VERSION_ID="18.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
  Linux intel-sut 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 UTC 2019 x86_64
  x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB

run-level 5 Apr 9 19:11

SPEC is set to: /home/cpu2017
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p2 ext4  439G   25G  392G   6% /

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.

BIOS Dell Inc. 2.1.7 04/03/2019
Memory:
  12x 002C069D002C 36ASF4G72FZ-2G9E2 32 GB 2 rank 2933
  12x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
 CC  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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================

(Continued on next page)
### Dell Inc. PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz)

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**SPECspeed2017_fp_base = 130**

**SPECspeed2017_fp_peak = 131**

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### Compiler Version Notes (Continued)

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<thead>
<tr>
<th>Compiler</th>
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<tr>
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<td>19.0.1.144</td>
<td>Apr-2019</td>
<td>Jan-2019</td>
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<tr>
<td>Fortran</td>
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<td>Apr-2019</td>
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SPEC CPU2017 Floating Point Speed Result

Dell Inc.  
PowerEdge R640 (Intel Xeon Gold 6238, 2.10GHz)  

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

Test Date: Apr-2019  
Hardware Availability: Apr-2019  
Software Availability: Jan-2019

Compiler Version Notes (Continued)
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
Intel (R) C (Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

Base Compiler Invocation
C benchmarks:  
icc -m64 -std=c11

Fortran benchmarks:  
ifort -m64

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

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

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 byte recl  
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:  
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

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

For Fortran benchmarks:
- `DSPEC_OPENMP`  
- `xCORE-AVX512`  
- `-ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
- `-nostandard-realloc-lhs`

Benchmarks using both Fortran and C:
- `xCORE-AVX512`  
- `-ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
- `-nostandard-realloc-lhs`

Benchmarks using Fortran, C, and C++:
- `xCORE-AVX512`  
- `-ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
- `-nostandard-realloc-lhs`

### Peak Compiler Invocation

#### C benchmarks:
- `icc -m64 -std=c11`

#### Fortran benchmarks:
- `ifort -m64`

Benchmarks using both Fortran and C:
- `ifort -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:
- `xCORE-AVX512`  
- `-ipo -O3 -no-prec-div -qopt-prefetch`
- `-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

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

Fortran benchmarks:

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

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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Tested with SPEC CPU2017 v1.0.5 on 2019-04-09 13:30:41-0400.