Dell Inc.
PowerEdge M640 (Intel Xeon Gold 6248R, 3.00 GHz)

SPEC CPU®2017 Floating Point Speed Result

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**Dell Inc.**

**PowerEdge M640 (Intel Xeon Gold 6248R, 3.00 GHz)**

**SPECspeed®2017_fp_base = 136**

**SPECspeed®2017_fp_peak = 137**

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Jun-2020

**Hardware Availability:** Feb-2020

**Tested by:** Dell Inc.

**Software Availability:** Apr-2020

**Threads**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>96</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>96</td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>96</td>
</tr>
<tr>
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</tr>
<tr>
<td>638.imagick_s</td>
<td>96</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>96</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>96</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>96</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 6248R
- **Max MHz:** 4000
- **Nominal:** 3000
- **Enabled:** 48 cores, 2 chips, 2 threads/core
- **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 (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
- **Storage:** 1 x 960GB SATA SSD
- **Other:** None

**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 2.6.3 released Feb-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
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## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>115</td>
<td>137</td>
<td>115</td>
<td>136</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:

- **KMP_AFFINITY** = "granularity=fine,compact"
- **LD_LIBRARY_PATH** = "/dev/shm/cpu2017-ic19.1u1/lib/intel64:/dev/shm/cpu2017-ic19.1u1/je5.0.1.64"
- **MALLOCS_CONF** = "retain:true"
- **OMP_STACKSIZE** = "192M"

## General Notes

Binaries compiled on a system with 1x Intel Core i9–9900K 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)

(Continued on next page)
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General Notes (Continued)

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
runcpu command invoked through numactl i.e.:
  numactl --interleave=all runcpu <etc>
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"

Platform Notes

BIOS settings:
Sub NUMA Cluster enabled
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 enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /dev/shm/cpu2017-ic19.1u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edc1e6e46a485a0011
running on localhost.localdomain Sun Jun 14 20:31:08 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)
  96 "processors"
Platform Notes (Continued)

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 : 48
physical 0: 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
physical 1: 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

From lscpu:
    Architecture:        x86_64
    CPU op-mode(s):      32-bit, 64-bit
    Byte Order:          Little Endian
    CPU(s):              96
    On-line CPU(s) list: 0-95
    Thread(s) per core:  2
    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:             1235.129
    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):
                        0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58
                        ,60,62,64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94
    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
                        ,61,63,65,67,69,71,73,75,77,79,81,83,85,87,89,91,93,95
    Flags:               fpu vmx ve de pse tsc msr cmov ss ht tm pe pse36 pmte pse36cwd msr pae mce cmov
                        pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
                        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 3dnowprefetch cpuid_fault epb cat_l3 cdp cpe
                        invpcid_single intel_pmic ssbd mba ibrs ibrd stibp ibrs_enhanced tpr_shadow vnmi
                        flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ERMS invpcid rtl
                        cqm mpx rdvt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
                        avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsave xsaves cqm_llc cqm_occup_llc
                        cqm_mbm_total

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<th>Test Date: Jun-2020</th>
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**SPECspeed®2017_fp_base = 136**  
**SPECspeed®2017_fp_peak = 137**

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### Platform Notes (Continued)

- `cqm_mbm_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 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
  - node 0 size: 192068 MB
  - node 0 free: 182152 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 77 79 81 83 85 87 89 91 93 95
  - node 1 size: 193500 MB
  - node 1 free: 186582 MB
  - node distances:
    - node 0 1
    - 0: 10 21
    - 1: 21 10

From `/proc/meminfo`

- `MemTotal: 394822576 kB`
- `HugePages_Total: 0`
- `Hugepagesize: 2048 kB`

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

- `os-release:
  "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:

(Continued on next page)
Dell Inc. PowerEdge M640 (Intel Xeon Gold 6248R, 3.00 GHz) SPECspeed®2017_fp_base = 136
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Platform Notes (Continued)

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 Jun 14 10:34
SPEC is set to: /dev/shm/cpu2017-ic19.1u1

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 189G 11G 179G 6% /dev/shm

From /sys/devices/virtual/dmi/id
BIOS: Dell Inc. 2.6.3 02/03/2020
Vendor: Dell Inc.
Product: PowerEdge M640
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:
5x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
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.

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**Base Compiler Invocation**

C benchmarks:
- icc

Fortran benchmarks:
- ifort

Benchmarks using both Fortran and C:
- ifort icc

---

**Compiler Version Notes (Continued)**

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.

---

Fortran  |  603.bwaves_s(base, peak) 649.fotonik3d_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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Base Compiler Invocation (Continued)

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
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:
-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:
-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:
-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++:
-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
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Peak 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

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

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<th>SPECspeed®2017_fp_base = 136</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak = 137</td>
</tr>
</tbody>
</table>

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

**Test Date:** Jun-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

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**Peak Optimization Flags (Continued)**

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -std=c11 -W1,-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 -qopenmp -DSPEC_OPENMP  
-mbranches-within-32B-boundaries -nostandard-realloc-lhs  
-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:

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