SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge M640 (Intel Xeon Silver 4214R, 2.40 GHz)

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

Test Date: Oct-2021
Hardware Availability: Apr-2019
Software Availability: May-2021

SPECspeed®2017_fp_base = 95.7
SPECspeed®2017_fp_peak = 96.8

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<thead>
<tr>
<th>Thread</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
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<tr>
<td>603.bwaves_s 24</td>
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<tr>
<td>607.cactuBSSN_s 24</td>
<td>97.2</td>
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<tr>
<td>619.lbm_s 24</td>
<td>87.9</td>
<td>87.9</td>
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<tr>
<td>621.wrf_s 24</td>
<td>72.5</td>
<td>72.5</td>
</tr>
<tr>
<td>627.cam4_s 24</td>
<td>87.9</td>
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<tr>
<td>628.pop2_s 24</td>
<td>76.1</td>
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<tr>
<td>638.imagick_s 24</td>
<td>60.3</td>
<td>60.3</td>
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<tr>
<td>644.nab_s 24</td>
<td>72.5</td>
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<tr>
<td>649.fotonik3d_s 24</td>
<td>68.6</td>
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</tr>
<tr>
<td>654.roms_s 24</td>
<td>85.6</td>
<td>85.6</td>
</tr>
</tbody>
</table>

Hardware

CPU Name: Intel Xeon Silver 4214R
Max MHz: 3500
Nominal: 2400
Enabled: 24 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: 16.5 MB I+D on chip per core
Other: None
Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)
Storage: 125 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 8.4 (Ootpa)
4.18.0-305.el8.x86_64
Compiler: 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
Parallel: Yes
Firmware: Version 2.12.2 released Jul-2021
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 and OS set to prefer performance
at the cost of additional power usage.
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Results Table

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<tr>
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<td>86.0</td>
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SPECspeed®2017_fp_base = 95.7
SPECspeed®2017_fp_peak = 96.8

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 = "/mnt/ramdisk/kavya/lib/intel64:/mnt/ramdisk/kavya/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
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
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)
Dell Inc. PowerEdge M640 (Intel Xeon Silver 4214R, 2.40 GHz)

SPECspeed®2017_fp_base = 95.7
SPECspeed®2017_fp_peak = 96.8

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.

Benchmark run from a 125 GB ramdisk created with the cmd: "mount -t tmpfs -o size=125G tmpfs /mnt/ramdisk"

Platform Notes

BIOS Settings:

Logical Processor : Disabled
Virtualization Technology : Disabled

System Profile : Custom
CPU Power Management : Maximum Performance
C1E : Disabled
C States : Autonomous
Memory Patrol Scrub : Disabled
Energy Efficiency Policy : Performance
CPU Interconnect Bus Link
Power Management : Disabled
PCI ASPM L1 Link
Power Management : Disabled

Sysinfo program /mnt/ramdisk/kavya/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Fri Oct 29 10:22:40 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) Silver 4214R CPU @ 2.40GHz
  2 "physical id"s (chips)
  24 "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 : 12
siblings : 12
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

From lscpu from util-linux 2.32.1:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Platform Notes (Continued)

Byte Order:          Little Endian
CPU(s):              24
On-line CPU(s) list: 0-23
Thread(s) per core:  1
Core(s) per socket:  12
Socket(s):           2
NUMA node(s):        2
Vendor ID:           GenuineIntel
BIOS Vendor ID:      Intel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
BIOS Model name:     Intel(R) Xeon(R) Silver 4214R CPU @ 2.40GHz
Stepping:            7
CPU MHz:             3020.853
CPU max MHz:         3500.0000
CPU min MHz:         1000.0000
BogoMIPS:            4800.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            320074K
NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22
NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23
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
                     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 sse2 ss7 sse4_1 sse4_2 x2apic movbe popcnt tsc
                     deadline_timer aes xsave avx f16c rdrand lahf_lm abtm 3nowprefetch
                     cpuid_fault epb cat_l3 cdp_l3
                     invpcid_single intel_p6in ssbd mba ibrs ibpb stibp ibrs_enhanced
                     fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets rm cqm mpx
                     rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt
                     avx512cd avx512bw avx512vl xsaveopt xsavecap xsaveprec xsavevm
                     cqm l1lc cqm_occup_l1c cqm_mbb_total cqm_mbb_local dtherm ida arat
                     pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

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
           node 0 size: 192074 MB
           node 0 free: 179473 MB
           node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23

(Continued on next page)
Platform Notes (Continued)

node 1 size: 193495 MB
node 1 free: 189748 MB
node distances:
node 0 1
  0: 10 21
  1: 21 10

From /proc/meminfo
  MemTotal:       394823860 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance
/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
  performance

From /etc/*release* /etc/*version*
  os-release:
    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): KVM: Mitigation: Split huge pages
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/swaps
  barriers and __user pointer

(Continued on next page)
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Platform Notes (Continued)

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Mitigation: Not affected

CVE-2019-11135 (TSX Asynchronous Abort):
Mitigation: TSX disabled

run-level 3 Oct 29 07:05

SPEC is set to: /mnt/ramdisk/kavya

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
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<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>11G</td>
<td>115G</td>
<td>9%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge M640
Product Family: PowerEdge

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:
- 6x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933, configured at 2400
- 4x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400
- 2x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2400

BIOS:
- BIOS Vendor: Dell Inc.
- BIOS Version: 2.12.2
- BIOS Date: 07/12/2021
- BIOS Revision: 2.12

(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 Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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**Compiler Version Notes (Continued)**

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**Base Compiler Invocation**

**C benchmarks:**

*icc*

**Fortran benchmarks:**

*ifort*

**Benchmarks using both Fortran and C:**

*ifort icc*
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Base Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
icpc icc ifort

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 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: basepeak = yes

**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 -qopenmp -nostandard-realloc-lhs -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
- 649.fotonik3d_s: basepeak = yes
- 654.roms_s: basepeak = yes

**Benchmarks using both Fortran and C:**

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

**Dell Inc.**

PowerEdge M640 (Intel Xeon Silver 4214R, 2.40 GHz)  

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>95.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>96.8</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 55  
**Test Date:** Oct-2021  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Hardware Availability:** Apr-2019  
**Software Availability:** May-2021

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### Peak Optimization Flags (Continued)

- **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 -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`

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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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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