## SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

**SPECspeed®2017_fp_base = 154**

**SPECspeed®2017_fp_peak = 157**

<table>
<thead>
<tr>
<th>Software</th>
<th>OS:</th>
<th>Red Hat Enterprise Linux 8.3 (Ootpa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; 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</td>
<td></td>
</tr>
<tr>
<td>Parallel:</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Firmware:</td>
<td>Version 1.2.1 released May-2021</td>
<td></td>
</tr>
<tr>
<td>File System:</td>
<td>tmpfs</td>
<td></td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
<td></td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
<td></td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>64-bit</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
<td></td>
</tr>
<tr>
<td>Power Management:</td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage.</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Hardware</th>
<th>CPU Name:</th>
<th>Intel Xeon Silver 4316</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz:</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>Nominal:</td>
<td>2300</td>
<td></td>
</tr>
<tr>
<td>Enabled:</td>
<td>40 cores, 2 chips</td>
<td></td>
</tr>
<tr>
<td>Orderable:</td>
<td>1.2 chips</td>
<td></td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 48 KB D on chip per core</td>
<td></td>
</tr>
<tr>
<td>L2:</td>
<td>1.25 MB I+D on chip per core</td>
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</tr>
<tr>
<td>L3:</td>
<td>30 MB I+D on chip per chip</td>
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</tr>
<tr>
<td>Other:</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Memory:</td>
<td>512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)</td>
<td></td>
</tr>
<tr>
<td>Storage:</td>
<td>225 GB on tmpfs</td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
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</tr>
</tbody>
</table>

### SPECspeed®2017_fp_base (154) vs SPECspeed®2017_fp_peak (157)
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>40</td>
<td>105</td>
<td>561</td>
<td>105</td>
<td>561</td>
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<td>105</td>
<td>561</td>
<td>105</td>
<td>561</td>
<td>105</td>
<td>560</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>40</td>
<td>86.9</td>
<td>192</td>
<td>84.3</td>
<td>198</td>
<td>86.3</td>
<td>193</td>
<td>40</td>
<td>86.9</td>
<td>192</td>
<td>84.3</td>
<td>198</td>
<td>86.3</td>
<td>193</td>
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<td>619.ibm_s</td>
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<td>113</td>
<td>47.6</td>
<td>110</td>
<td>48.6</td>
<td>108</td>
<td>40</td>
<td>46.3</td>
<td>113</td>
<td>47.6</td>
<td>110</td>
<td>48.6</td>
<td>108</td>
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<tr>
<td>621.wrf_s</td>
<td>40</td>
<td>99.7</td>
<td>133</td>
<td>97.6</td>
<td>136</td>
<td>97.1</td>
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<td>40</td>
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<td>89.2</td>
<td>148</td>
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<td>627.cam4_s</td>
<td>40</td>
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<td>109</td>
<td>82.7</td>
<td>107</td>
<td>81.2</td>
<td>109</td>
<td>40</td>
<td>81.6</td>
<td>109</td>
<td>82.7</td>
<td>107</td>
<td>81.2</td>
<td>109</td>
</tr>
<tr>
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<td>40</td>
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<td>154</td>
<td>77.2</td>
<td>154</td>
<td>77.2</td>
<td>40</td>
<td>153</td>
<td>77.4</td>
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<td>77.2</td>
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<tr>
<td>638.imagick_s</td>
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<td>110</td>
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<td>109</td>
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<td>40</td>
<td>110</td>
<td>132</td>
<td>109</td>
<td>132</td>
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<td>644.nab_s</td>
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<td>66.5</td>
<td>263</td>
<td>66.4</td>
<td>263</td>
<td>66.4</td>
<td>263</td>
<td>40</td>
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<td>59.1</td>
<td>296</td>
<td>59.1</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>91.1</td>
<td>100</td>
<td>91.2</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>654.roms_s</td>
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<td>161</td>
<td>97.2</td>
<td>162</td>
<td>99.0</td>
<td>159</td>
<td>40</td>
<td>97.8</td>
<td>161</td>
<td>97.2</td>
<td>162</td>
<td>99.0</td>
<td>159</td>
</tr>
</tbody>
</table>

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/ramdisk2/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk2/cpu2017-1.1.5-ic2021.1/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.
Dell Inc. PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 154
SPECspeed®2017_fp_peak = 157

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

General Notes (Continued)

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.

Benchmark run from a 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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

Sysinfo program /mnt/ramdisk2/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afea89d4b38e2f1c
running on localhost.localdomain Tue May 25 16:21:11 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 4316 CPU @ 2.30GHz
 2 "physical id"s (chips)
 40 "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 : 20
siblings : 20
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

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

(Continued on next page)
Dell Inc.

PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 154
SPECspeed®2017_fp_peak = 157

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: May-2021
Hardware Availability: May-2021
Tested by: Dell Inc.
Software Availability: Feb-2021

Platform Notes (Continued)

CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 1
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
Stepping: 6
CPU MHz: 2297.001
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38
NUMA nodel CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39
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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abal_coll mmxext cmov apic cpuid msr pbe syscall nx pdpe1gb
rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid

/proc/cpuinfo cache data
cache size : 30720 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
node 0 size: 249378 MB
node 0 free: 240295 MB
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39
node 1 size: 250595 MB
node 1 free: 251571 MB
node distances:

(Continued on next page)
Dell Inc. PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 154
SPECspeed®2017_fp_peak = 157

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Platform Notes (Continued)

node 0 1
0: 10 20
1: 20 10

From /proc/meminfo
MemTotal: 527813836 kB
 HugePages_Total: 0
 Hugepagesize: 2048 kB

/sbin/tuned-adm active
Current active profile: throughput-performance

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

system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)

uname -a:
Linux localhost.localdomain 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 2021 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsqs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

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

Dell Inc.

PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

| SPECspeed®2017_fp_base | 154 |
| SPECspeed®2017_fp_peak | 157 |

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

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Platform Notes (Continued)

SPEC is set to: /mnt/ramdisk2/cpu2017-1.1.5-ic2021.1
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 13G 213G 6% /mnt/ramdisk2

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R750
Product Family: PowerEdge
Serial: 1234567

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:
12x 002C069D002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666
4x 00AD063200AD HMAA4GR7AJR8N-XN 32 GB 2 rank 3200, configured at 2666
16x Not Specified Not Specified

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.2.1
BIOS Date: 05/06/2021
BIOS Revision: 1.2

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base) |
|==============================================================================

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.

==============================================================================
| C               | 644.nab_s(peak) |
|==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

(Continued on next page)
Dell Inc.

PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 154
SPECspeed®2017_fp_peak = 157

Compiler Version Notes (Continued)

==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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<tr>
<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>C</td>
<td>644.nab_s(peak)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
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<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113</td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>C++, C, Fortran</td>
<td>607.cactuBSSN_s(base, peak)</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
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<tr>
<td>Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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<td>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</td>
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<tr>
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<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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<tr>
<td>Fortran</td>
<td>603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)</td>
</tr>
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<td>-----------------------</td>
<td>---------------------------------------------------------------</td>
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<td>---------------------------------------------------------------</td>
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<tr>
<td>Fortran, C</td>
<td>621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)</td>
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<td>---------------------------------------------------------------</td>
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SPEC®2017_fp_base = 154
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: May-2021
Hardware Availability: May-2021
Software Availability: Feb-2021

Compiler Version Notes (Continued)

Copyright (C) 1985–2020 Intel Corporation. All rights reserved.
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.

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
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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries

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

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**PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)**

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<td>SPECspeed®2017_fp_peak</td>
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</table>

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

**Test Date:** May-2021  
**Hardware Availability:** May-2021  
**Software Availability:** Feb-2021

---

**Base Optimization Flags (Continued)**

Fortran benchmarks:
- `-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -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-AVX512 -ipo -O3`  
- `-no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`  
- `-DSPEC_OPENMP`  
- `-mbranches-within-32B-boundaries`  
- `L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3`  
- `-no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`  
- `-DSPEC_OPENMP`  
- `-mbranches-within-32B-boundaries`  
- `L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

---

**Peak Compiler Invocation**

C benchmarks (except as noted below):
- `icc`
- `644.nab_s: icx`

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
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)

SPECspeed®2017_fp_base = 154

SPECspeed®2017_fp_peak = 157

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: May-2021
Tested by: Dell Inc.
Hardware Availability: May-2021
Software Availability: Feb-2021

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -fiopenmp
-DSPEC_OPENMP -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
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(pass2) -ipo -xCORE-AVX512 -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.cactusBSSN_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-ic2021-official-linux64_revA.xml
## SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

**PowerEdge R750 (Intel Xeon Silver 4316, 2.30 GHz)**

<table>
<thead>
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