



SPEC CPU®2017 Floating Point Speed Result

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Dell Inc.

SPECspeed®2017_fp_base = 116

PowerEdge R550 (Intel Xeon Silver 4310, 2.10 GHz)

SPECspeed®2017_fp_peak = 118

CPU2017 License: 55

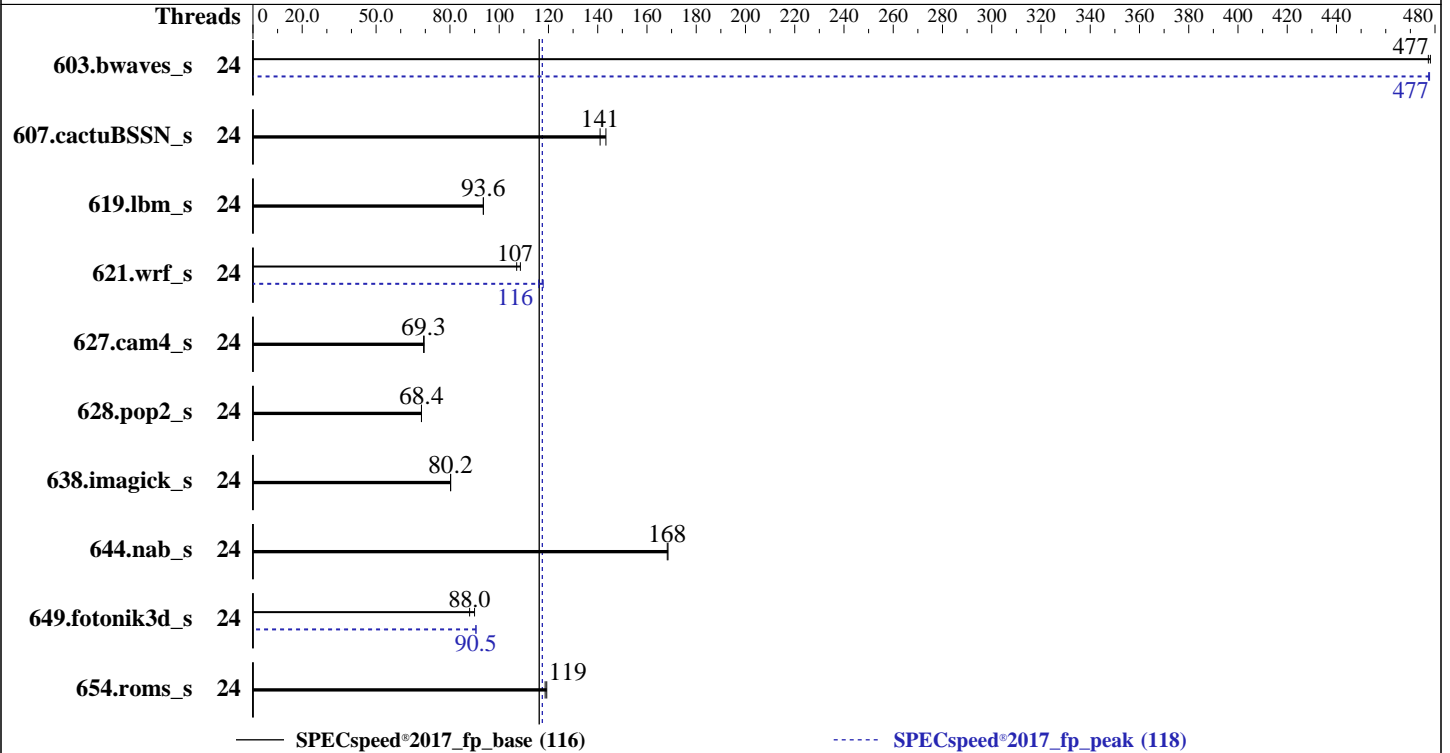
Test Date: Apr-2022

Test Sponsor: Dell Inc.

Hardware Availability: May-2021

Tested by: Dell Inc.

Software Availability: Dec-2021



Hardware

CPU Name: Intel Xeon Silver 4310
 Max MHz: 3300
 Nominal: 2100
 Enabled: 24 cores, 2 chips
 Orderable: 1,2 chips
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1.25 MB I+D on chip per core
 L3: 18 MB I+D on chip per chip
 Other: None
 Memory: 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)
 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 2021.5 of Intel Fortran Compiler Classic for Linux;
 C/C++: Version 2021.5 of Intel C/C++ Compiler Classic for Linux
 Parallel: Yes
 Firmware: Version 1.5.4 released Dec-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

Benchmark	Base						Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	24	<u>124</u>	<u>477</u>	123	478			24	<u>124</u>	<u>477</u>	123	478		
607.cactuBSSN_s	24	116	143	<u>118</u>	<u>141</u>			24	116	143	<u>118</u>	<u>141</u>		
619.lbm_s	24	<u>56.0</u>	<u>93.6</u>	56.0	93.6			24	<u>56.0</u>	<u>93.6</u>	56.0	93.6		
621.wrf_s	24	122	109	<u>124</u>	<u>107</u>			24	112	118	<u>114</u>	<u>116</u>		
627.cam4_s	24	127	69.5	<u>128</u>	<u>69.3</u>			24	127	69.5	<u>128</u>	<u>69.3</u>		
628.pop2_s	24	<u>174</u>	<u>68.4</u>	174	68.4			24	<u>174</u>	<u>68.4</u>	174	68.4		
638.imagick_s	24	<u>180</u>	<u>80.2</u>	180	80.3			24	<u>180</u>	<u>80.2</u>	180	80.3		
644.nab_s	24	<u>104</u>	<u>168</u>	104	169			24	<u>104</u>	<u>168</u>	104	169		
649.fotonik3d_s	24	101	90.0	<u>104</u>	<u>88.0</u>			24	101	90.6	<u>101</u>	<u>90.5</u>		
654.roms_s	24	<u>133</u>	<u>119</u>	132	119			24	<u>133</u>	<u>119</u>	132	119		

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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/cpu2017-1.1.8-ic2022.0-DL/lib/intel64:/mnt/ramdisk/cpu2017
  -1.1.8-ic2022.0-DL/je5.0.1-64"
MALLOCONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB 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
sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

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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 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/cpu2017-1.1.8-ic2022.0-DL/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost.localdomain Tue Apr 19 14:02:25 2022

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 4310 CPU @ 2.10GHz

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 6 7 8 9 10 11

physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11

From lscpu from util-linux 2.32.1:

Architecture: x86_64

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Platform Notes (Continued)

```

CPU op-mode(s):      32-bit, 64-bit
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:               106
Model name:           Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
BIOS Model name:      Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
Stepping:            6
CPU MHz:              2701.269
BogoMIPS:             4200.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            18432K
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 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
aperfperf 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 invpcid_single
intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma
clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1
xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect wbnoinvd
dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid fsrm md_clear pconfig
flush_lld arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 18432 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
node 0 size: 257145 MB
node 0 free: 246176 MB

```

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Platform Notes (Continued)

```
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23
node 1 size: 258042 MB
node 1 free: 253897 MB
node distances:
node 0 1
0: 10 20
1: 20 10
```

```
From /proc/meminfo
MemTotal: 527552780 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

```
/sbin/tuned-adm active
Current active profile: throughput-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): Not affected
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:
```

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Platform Notes (Continued)

conditional, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Apr 19 11:03

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2022.0-DL

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
tmpfs	tmpfs	125G	9.6G	116G	8%	/mnt/ramdisk

From /sys/devices/virtual/dmi/id
 Vendor: Dell Inc.
 Product: PowerEdge R550
 Product Family: PowerEdge
 Serial: 5GCVNK3

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:
 16x 002C00B3002C 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2666

BIOS:
 BIOS Vendor: Dell Inc.
 BIOS Version: 1.5.4
 BIOS Date: 12/17/2021
 BIOS Revision: 1.5

(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 2021.5.0 Build 20211109_000000
Copyright (C) 1985-2021 Intel Corporation. All rights reserved.
=====
```

```
=====
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
=====
```

```
Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
```

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Compiler Version Notes (Continued)

Intel(R) 64, Version 2021.5.0 Build 20211109_000000
 Copyright (C) 1985-2021 Intel Corporation. All rights reserved.
 Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
 64, Version 2021.5.0 Build 20211109_000000
 Copyright (C) 1985-2021 Intel Corporation. All rights reserved.
 Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
 Intel(R) 64, Version 2021.5.0 Build 20211109_000000
 Copyright (C) 1985-2021 Intel Corporation. All rights reserved.

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

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
 Intel(R) 64, Version 2021.5.0 Build 20211109_000000
 Copyright (C) 1985-2021 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 Classic for applications running on
 Intel(R) 64, Version 2021.5.0 Build 20211109_000000
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 Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
 64, Version 2021.5.0 Build 20211109_000000
 Copyright (C) 1985-2021 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



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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
```

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 -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-AVX512 -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:

icc

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Peak Compiler Invocation (Continued)

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-AVX512
-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: 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-AVX512 -O3 -no-prec-div

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Peak Optimization Flags (Continued)

621.wrf_s (continued):

```
-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

<http://www.spec.org/cpu2017/flags/Dell-ic2022-linux64-v1.0.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.5.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Dell-ic2022-linux64-v1.0.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.5.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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