Dell Inc.

PowerEdge R450 (Intel Xeon Gold 5317, 3.00 GHz)

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

**Test Date:** Dec-2021
**Hardware Availability:** Oct-2021
**Software Availability:** May-2021

---

**Hardware**

- **CPU Name:** Intel Xeon Gold 5317
- **Max MHz:** 3600
- **Nominal:** 3000
- **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 2933)
- **Storage:** 125 GB on tmpfs
- **Other:** None

---

**Software**

- **OS:** Red Hat Enterprise Linux 8.4 (Ootpa) 4.18.0-305.el8.x86_64
- **Compiler:** 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;
- **Parallel:** Yes
- **Firmware:** Version 1.3.8 released Aug-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.

---

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

**SPECspeed®2017_fp_base = 131**

**SPECspeed®2017_fp_peak = 134**

---

### Benchmarks

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>24</td>
<td>158</td>
<td>(158)</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
<td>103</td>
<td>(125)</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>24</td>
<td>81.8</td>
<td>(97.6)</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>24</td>
<td>76.8</td>
<td>(136)</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>24</td>
<td>96.9</td>
<td>(202)</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>24</td>
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<td>(259)</td>
</tr>
<tr>
<td>638.imagick_s</td>
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<td>125</td>
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<tr>
<td>644.nab_s</td>
<td>24</td>
<td>202</td>
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</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>24</td>
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</tr>
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Test Date: Dec-2021
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Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>24</td>
<td>118</td>
<td>498</td>
<td>119</td>
<td>497</td>
<td>24</td>
<td>118</td>
<td>498</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>105</td>
<td>158</td>
<td>104</td>
<td>160</td>
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<td>619.lbm_s</td>
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<td>104</td>
<td>24</td>
<td>50.8</td>
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<td>50.5</td>
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<tr>
<td>621.wrf_s</td>
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<td>126</td>
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<td>97.0</td>
<td>136</td>
<td>97.4</td>
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<td>627.cam4_s</td>
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<td>83.0</td>
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<td>108</td>
<td>81.8</td>
<td>107</td>
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<tr>
<td>626.pop2_s</td>
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<td>154</td>
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<td>76.8</td>
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<td>154</td>
<td>76.9</td>
<td>155</td>
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<tr>
<td>638.imagick_s</td>
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<td>97.6</td>
<td>146</td>
<td>98.6</td>
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<td>97.6</td>
<td>146</td>
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<tr>
<td>644.nab_s</td>
<td>24</td>
<td>86.5</td>
<td>202</td>
<td>86.5</td>
<td>202</td>
<td>24</td>
<td>76.3</td>
<td>229</td>
<td>76.2</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>93.8</td>
<td>97.2</td>
<td>94.0</td>
<td>96.9</td>
<td>24</td>
<td>93.8</td>
<td>97.2</td>
<td>94.0</td>
</tr>
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<td>125</td>
<td>126</td>
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</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 131
SPECspeed®2017_fp_peak = 134

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-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/jemalloc-5.0.1-64"
MALLOCONF = "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.

(Continued on next page)
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CPU2017 License: 55
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Test Date: Dec-2021
Hardware Availability: Oct-2021
Software Availability: May-2021

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-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c64d
running on localhost.localdomain Wed Dec 8 04:07:32 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) Gold 5317 CPU @ 3.00GHz
  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

(Continued on next page)
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) Gold 5317 CPU @ 3.00GHz
BIOS Model name: Intel(R) Xeon(R) Gold 5317 CPU @ 3.00GHz
Stepping: 6
CPU MHz: 3304.376
BogoMIPS: 6000.00
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 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
xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pt ssbd mba ibrs ibpb ibrs_enhanced fsgsbase tsc_adjust bmi1 hle avx2
smep bmi2 erms invvpid cmn rdt_a avx512f avx512dq rdseed adx smap avx512ifma
clflushopt clwb intel_pt avx512cd sha_hni avx512bw avx512vl xsaveopt xsaves xgetbv
xsaves cmq_l1c cmq_mbm_total cmq_mbm_local split_lock_detect wbnoinvd
idt dtherm ida arat pin avx512vmbi umip pku ospke avx512_vmbi gfni vaes vclmulqdq
avx512_vnni avx512_vbta lg tme avx512_vpopcntdq la57 rdpid fsrm md_clear pconfig
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: 257146 MB
  node 0 free: 253806 MB

(Continued on next page)
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Test Date: Dec-2021
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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: 245633 MB
node distances:
node 0 1
  0: 10 20
  1: 20 10

From /proc/meminfo
  MemTotal: 527553792 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):
  Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass):
  Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1):
  Mitigation: Enhanced IBRS, IBPB:
CVE-2017-5715 (Spectre variant 2):
SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2022 Standard Performance Evaluation Corporation

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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 Dec 8 01:04

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2021.1

Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 125G 10G 116G 8% /mnt/ramdisk

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge R450
Product Family: PowerEdge
Serial: 1S31501

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 002C00B30002 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.3.8
BIOS Date: 08/31/2021
BIOS Revision: 1.3

(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,

(Continued on next page)
Dell Inc.  
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| SPECspeed®2017_fp_base = 131 |
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CPU2017 License: 55  
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**Compiler Version Notes (Continued)**

Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
| 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.            |
-----------------------------------------------------------------------------
| C++, C, Fortran | 607.cactuBSSN_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.             
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.             
Intel(R) Fortran 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.             |
-----------------------------------------------------------------------------
| 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 2021.1 Build 20201112_000000  
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)   |
(Continued on next page)
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Compiler Version Notes (Continued)

Intel(R) Fortran 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.

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

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

C benchmarks (continued):
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries

Fortran benchmarks:
-m64 -W1,-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 -W1,-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 -W1,-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 (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
Dell Inc.  

PowerEdge R450 (Intel Xeon Gold 5317, 3.00 GHz)  

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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 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-f1to -mfpmath=sse -funroll-loops -fopenmp
-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(pass 2) -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.cactuBSSN_s: basepeak = yes
### SPEC CPU®2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge R450 (Intel Xeon Gold 5317, 3.00 GHz)

<table>
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**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** Dec-2021

**Hardware Availability:** Oct-2021

**Software Availability:** May-2021

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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