Dell Inc.

PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

SPECrates:  
- SPECrate2017_fp_base = 82.8  
- SPECrate2017_fp_peak = 85.1

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

Test Date: Feb-2018  
Hardware Availability: Sep-2017  
Software Availability: Sep-2017

Hardware

- CPU Name: Intel Xeon Silver 4110  
- Max MHz.: 3000  
- Nominal: 2100  
- Enabled: 16 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: 11 MB I+D on chip per chip  
- Other: None  
- Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)  
- Storage: 1 TB SATA 7200 RPM  
- Other: None

Software

- OS: SUSE Linux Enterprise Server 12 SP3 (x86_64)  
- 4.4.114-94.11-default  
- Compiler: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;  
- Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux  
- Parallel: No  
- Firmware: Version 1.3.7 released Feb-2018  
- File System: xfs  
- System State: Run level 3 (multi-user)  
- Base Pointers: 64-bit  
- Peak Pointers: 64-bit  
- Other: None
Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

<table>
<thead>
<tr>
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<th>Copies</th>
<th>Seconds</th>
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Weights used: 507 (subjective) 503 (subjective) 508 (objective) 510 (subjective) 511 (subjective) 519 (objective) 521 (subjective) 526 (objective) 527 (objective) 538 (subjective) 544 (subjective) 549 (objective) 554 (objective)

Results Table

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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"

General Notes
Environment variables set by runcpu before the start of the run:

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.4
Yes: 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) 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

(Continued on next page)
Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

SPECrated2017_fp_base = 82.8
SPECrated2017_fp_peak = 85.1

General Notes (Continued)

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>

Platform Notes

BIOS settings:
Sub NUMA Cluster disabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1EE disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub disabled
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /root/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on linux-5j67 Wed Feb 28 04:52:01 2018

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 4110 CPU @ 2.10GHz
  2  "physical id"s (chips)
  32 "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 : 8
siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7
  physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 32
  On-line CPU(s) list: 0-31
  Thread(s) per core: 2

(Continued on next page)
### Platform Notes (Continued)

Core(s) per socket: 8  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz  
Stepping: 4  
CPU MHz: 2095.173  
BogoMIPS: 4190.34  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 11264K  
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30  
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31  
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 n敗 good nocp1 xtopology nonstop_tsc aperfmperf eagerfpu 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 abml1 hle avx2 smep bmi1 bmi2 5ms invpcid rtm cqm mx axv512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1 cqm_llc cqm_occup_llc pku ospke

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  
node 0 size: 95353 MB  
node 0 free: 94965 MB  
node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31  
node 1 size: 96748 MB  
node 1 free: 96421 MB  
node distances:  
node 0 1  
0: 10 21  
1: 21 10  

From /proc/meminfo  
MemTotal: 196713216 KB  

(Continued on next page)
**SPEC CPU2017 Floating Point Rate Result**

**Dell Inc.**

PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base = 82.8</th>
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<tr>
<td>SPECrate2017_fp_peak = 85.1</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.

---

**Platform Notes (Continued)**

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<tr>
<td>Hugepagesize:</td>
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</table>

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

**SuSE-release:**

SUSE Linux Enterprise Server 12 (x86_64)  
VERSION = 12  
PATCHLEVEL = 3

# This file is deprecated and will be removed in a future service pack or release.  
# Please check /etc/os-release for details about this release.

**os-release:**

NAME="SLES"  
VERSION="12-SP3"  
VERSION_ID="12.3"  
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"  
ID="sles"  
ANSI_COLOR="0;32"  
CPE_NAME="cpe:/o:suse:sles:12:sp3"

**uname -a:**

Linux linux-5j67 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)  
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Feb 26 19:49

SPEC is set to: /root/cpu2017

**Filesystem** | **Type** | **Size** | **Used** | **Avail** | **Use%** | **Mounted on**
<table>
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<tr>
<td>/dev/sda2</td>
<td>xfs</td>
<td>928G</td>
<td>25G</td>
<td>903G</td>
<td>3%</td>
<td>/</td>
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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.

**BIOS Dell Inc. 1.3.7 02/09/2018**

**Memory:**

12x 00CE063200CE M393A2K43BB1-CTD 16 GB 2 rank 2666, configured at 2400  
4x Not Specified Not Specified

(End of data from sysinfo program)

---

**Compiler Version Notes**

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<table>
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<tr>
<th>CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base)</th>
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(Continued on next page)
Compiler Version Notes (Continued)

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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(Continued on next page)
SPEC CPU2017 Floating Point Rate Result

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Compiler Version Notes (Continued)

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Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

-----------------------------------------------
FC  507.cactuBSSN_r(peak)

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FC  554.roms_r(peak)

ifort (IFORT) 18.0.0 20170811
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
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SPEC CPU2017 Floating Point Rate Result

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CPU2017 License: 55  Test Date:  Feb-2018
Test Sponsor:  Dell Inc.  Hardware Availability:  Sep-2017
Tested by:  Dell Inc.  Software Availability:  Sep-2017

Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Base Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64 -std=c11

Benchmarks using both C and C++:
-m64 -std=c11

Benchmarks using Fortran, C, and C++:
-m64 -std=c11
Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

SPECrate2017_fp_base = 82.8
SPECrate2017_fp_peak = 85.1

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

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3

544.nab_r: Same as 519.lbm_r

C++ benchmarks:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Fortran benchmarks:

(Continued on next page)
Dell Inc.
PowerEdge C6420 (Intel Xeon Silver 4110, 2.10 GHz)

SPECrate2017_fp_base = 82.8
SPECrate2017_fp_peak = 85.1

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

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Benchmarks using Fortran, C, and C++:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte

Peak Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64 -std=c11

Benchmarks using both C and C++:
-m64 -std=c11

(Continued on next page)
### Peak Other Flags (Continued)

Benchmarks using Fortran, C, and C++:
- `-m64` `-std=c11`

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: