## SPEC CPU®2017 Floating Point Rate Result

### Dell Inc.

**PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)**

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
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<td>208</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>508.namd_r</td>
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<td>510.parest_r</td>
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<td>519.lbm_r</td>
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<td>521.wrf_r</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
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<tr>
<td>538.imagick_r</td>
<td>40</td>
<td>381</td>
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<tr>
<td>544.nab_r</td>
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<td>243</td>
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<tr>
<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
<td>20</td>
<td>83.8</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Silver 4310T
- **Max MHz:** 3400
- **Nominal:** 2300
- **Enabled:** 20 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **Cache L2:** 1.25 MB I+D on chip per core
- **Cache L3:** 15 MB I+D on chip per core
- **Other:** None
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
- **Storage:** 125 GB on tmpfs
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux 8.2 (Ootpa)
- **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;
  C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
- **Firmware:** No
- **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.

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** May-2021

**Hardware Availability:** Apr-2021

**Software Availability:** Dec-2020

---

Dell Inc.

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SPEC CPU®2017 Floating Point Rate Result

Dell Inc.
PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)

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

Test Date: May-2021
Hardware Availability: Apr-2021
Software Availability: Dec-2020

SPECrater®2017_fp_base = 167
SPECrater®2017_fp_peak = 172

Results Table

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<thead>
<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
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<td>354</td>
<td>89.9</td>
</tr>
</tbody>
</table>

SPECrater®2017_fp_base = 167
SPECrater®2017_fp_peak = 172

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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"

Environment Variables Notes

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

LD_LIBRARY_PATH =
"/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/je5.0.1-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
Dell Inc.
PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Dell Inc.
SPECrate®2017_fp_base = 167
SPECrate®2017_fp_peak = 172

General Notes (Continued)

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) 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
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>
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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

Platform Notes

BIOS Settings:
    Sub NUMA Cluster : 2-Way Clustering
    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/ramdisk/cpu2017-1.1.7-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Mon May 24 00:09:16 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 4310T CPU @ 2.30GHz
    2 "physical id"s (chips)

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

Dell Inc.
PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)

SPECrade®2017_fp_base = 167
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: May-2021
Hardware Availability: Apr-2021
Software Availability: Dec-2020

Platform Notes (Continued)

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 : 10
siblings : 20
physical 0: cores 0 1 2 3 4 5 6 7 8 9
physical 1: cores 0 1 2 3 4 5 6 7 8 9

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 2
Core(s) per socket: 10
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
Stepping: 6
CPU MHz: 1425.263
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 15360K
NUMA node0 CPU(s): 0-9,20-29
NUMA node1 CPU(s): 10-19,30-39
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 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
xtrm 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 ssbd
mba ibpb stibp ibrs enhanced tpr_shadow vmx flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid rtm cqm rdt_a avx512f avx512dq
rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ha avx512bw
avx512vl xsaveopt xsave xsaveopt xsaves cqm_llc cqm_occupy_llc cqm_mbb_total
cqm_mbb_local wbnoinvd dtherm ida arat pln pts avx512vmbi umip pku ospke
avx512_vbmi2 gfn paes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq
la57 rdpid md_clear pconf vflush_lld arch_capabilities

/proc/cpuinfo cache data
Dell Inc.
PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)

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Tested by: Dell Inc.

SPECRate®2017_fp_base = 167
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Test Date: May-2021
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Software Availability: Dec-2020

Platform Notes (Continued)

cache size : 15360 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 1 2 3 4 5 6 7 8 9 20 21 22 23 24 25 26 27 28 29
node 0 size: 515485 MB
node 0 free: 502598 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 516061 MB
node 1 free: 498528 MB
node distances:
node 0 1
0: 10 20
1: 20 10

From /proc/meminfo
MemTotal: 1056303836 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="8.2 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.2"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

uname -a:
Linux localhost.localdomain 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020
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

(Continued on next page)
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Test Date: May-2021
Hardware Availability: Apr-2021
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Platform Notes (Continued)

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 sanitation

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

CVE-2020-0543 (Special Register Buffer Data Sampling): No status reported
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 May 23 19:09
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.7-ic2021.1

<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>
</tr>
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<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>24G</td>
<td>102G</td>
<td>20%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id
Vendor: Dell Inc.
Product: PowerEdge C6520
Product Family: PowerEdge
Serial: SDPT078

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:
16x 00AD063200AD HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: Dell Inc.
BIOS Version: 1.1.3
BIOS Date: 04/27/2021
BIOS Revision: 1.1

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
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<th>519.lbm_r(base, peak) 538.imagick_r(base, peak)</th>
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<tr>
<td></td>
<td>544.nab_r(base, peak)</td>
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==============================================================================

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Dell Inc.  
PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)  

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

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Compiler Version Notes (Continued)

<table>
<thead>
<tr>
<th>Version 2021.1 Build 20201113</th>
<th>Copyright (C) 1985-2020 Intel Corporation. All rights reserved.</th>
</tr>
</thead>
</table>

```plaintext
------------------------------------------
C++ | 508.namd_r(base, peak) 510.parest_r(base, 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 | 511.povray_r(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.

------------------------------------------
C++, C | 511.povray_r(base) 526.blender_r(base, 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 | 511.povray_r(peak)
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Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on 
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C++, C | 511.povray_r(base) 526.blender_r(base, peak)
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Version 2021.1 Build 20201113 
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

(Continued on next page)```
Compiler Version Notes (Continued)

------------------------------------------------------------------------------
C++, C, Fortran | 507.cactuBSSN_r(base, 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.
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.
------------------------------------------------------------------------------
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                   | 554.roms_r(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      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
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CPU2017 License: 55
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx 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
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

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

C++ benchmarks:
-\texttt{-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto}
-\texttt{-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4}
-\texttt{-mbranches-within-32B-boundaries -ljemalloc}
-\texttt{-L/usr/local/jemalloc64-5.0.1/lib}

Fortran benchmarks:
-\texttt{-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div}
-\texttt{-qopt-prefetch -ffinite-math-only}
-\texttt{-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4}
-\texttt{-nostandard-realloc-lhs -align array32byte -auto}
-\texttt{-mbranches-within-32B-boundaries -ljemalloc}
-\texttt{-L/usr/local/jemalloc64-5.0.1/lib}

Benchmarks using both Fortran and C:
-\texttt{-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math}
-\texttt{-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo}
-\texttt{-no-prec-div -qopt-prefetch -ffinite-math-only}
-\texttt{-qopt-multiple-gather-scatter-by-shuffles}
-\texttt{-mbranches-within-32B-boundaries -nostandard-realloc-lhs}
-\texttt{-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib}

Benchmarks using both C and C++:
-\texttt{-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math}
-\texttt{-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4}
-\texttt{-mbranches-within-32B-boundaries -ljemalloc}
-\texttt{-L/usr/local/jemalloc64-5.0.1/lib}

Benchmarks using Fortran, C, and C++:
-\texttt{-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math}
-\texttt{-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3}
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-\texttt{-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib}

Peak Compiler Invocation

C benchmarks:
\texttt{icx}

C++ benchmarks:
\texttt{icpx}

(Continued on next page)
## Dell Inc.

PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)

<table>
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<tr>
<th>SPECrate®2017_fp_base</th>
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### CPU2017 License: 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** May-2021

**Hardware Availability:** Apr-2021

**Software Availability:** Dec-2020

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### Peak Compiler Invocation (Continued)

Fortran benchmarks:

`ifort`

Benchmarks using both Fortran and C:

`ifort icx`

Benchmarks using both C and C++:

- `511.povray_r`: `icpc icc`
- `526.blender_r`: `icpx icx`

Benchmarks using Fortran, C, and C++:

`icpx icx ifort`

---

### Peak Portability Flags

Same as Base Portability Flags

---

### Peak Optimization Flags

**C benchmarks:**

- `519.lbm_r`: `basepeak = yes`
- `538.imagick_r`: `basepeak = yes`

**C++ benchmarks:**

- `508.namd_r`: `basepeak = yes`

(Continued on next page)
## Dell Inc.

**PowerEdge C6520 (Intel Xeon Silver 4310T, 2.30 GHz)**

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### SPEC CPU®2017 Floating Point Rate Result

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### Peak Optimization Flags (Continued)

**Fortran benchmarks:**

- 503.bwaves_r: basepeak = yes
- 549.fotonik3d_r: basepeak = yes
- 554.roms_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
  -no-prec-div -qopt-prefetch -ffinite-math-only
  -qopt-multiple-gather-scatter-by-shuffles
  -qopt-mem-layout-trans=4 -nostandard-realloc-lhs
  -align array32byte -auto -mbranches-within-32B-boundaries
  -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

**Benchmarks using both Fortran and C:**

- 521.wrf_r: basepeak = yes
- 527.cam4_r: basepeak = yes

**Benchmarks using both C and C++:**

- 511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
  -ipo -no-prec-div -qopt-prefetch -ffinite-math-only
  -qopt-multiple-gather-scatter-by-shuffles
  -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
- 526.blender_r: basepeak = yes

**Benchmarks using Fortran, C, and C++:**

- 507.cactuBSSN_r: 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


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Page 12  Standard Performance Evaluation Corporation (info@spec.org)  https://www.spec.org/
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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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