**SPEC CPU®2017 Integer Rate Result**

Dell Inc.  

PowerEdge C6520 (Intel Xeon Gold 5318S, 2.10 GHz)  

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** May-2021  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2020  

**SPECrate®2017_int_base = 316**  
**SPECrate®2017_int_peak = 327**

### Hardware

**CPU Name:** Intel Xeon Gold 5318S  
**Max MHz:** 3400  
**Nominal:** 2100  
**Enabled:** 48 cores, 2 chips, 2 threads/core  
**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:** 36 MB I+D on chip per chip  
**Other:** None  
**Memory:** 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2933)  
**Storage:** 125 GB on tmpfs  
**Other:** None

### Software

**OS:** Red Hat Enterprise Linux 8.2 (Ootpa)  
4.18.0-193.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;  
C/C++: Version 2021.1 of Intel C/C++ Compiler  
Classic Build 20201112 for Linux

**Parallel:** No  
**Firmware:** Version 1.1.3 released Apr-2021  
**File System:** tmpfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 32/64-bit  
**Other:** jemalloc memory allocator V5.0.1  
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>96</td>
<td>711</td>
<td>215</td>
<td>712</td>
<td>215</td>
<td>96</td>
<td>606</td>
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<tr>
<td>502.gcc_r</td>
<td>96</td>
<td>514</td>
<td>264</td>
<td>514</td>
<td>265</td>
<td>96</td>
<td>445</td>
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<td>446</td>
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<tr>
<td>505.mcf_r</td>
<td>96</td>
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<td>208</td>
<td>96</td>
<td>604</td>
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<td>605</td>
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<tr>
<td>523.xalancbmk_r</td>
<td>96</td>
<td>254</td>
<td>399</td>
<td>254</td>
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<td>96</td>
<td>254</td>
<td>399</td>
<td>254</td>
</tr>
<tr>
<td>525.x264_r</td>
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<td>261</td>
<td>645</td>
<td>261</td>
<td>645</td>
<td>96</td>
<td>249</td>
<td>676</td>
<td>248</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
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<td>470</td>
<td>234</td>
<td>470</td>
<td>234</td>
<td>96</td>
<td>470</td>
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<tr>
<td>541.leela_r</td>
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<td>694</td>
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<tr>
<td>548.exchange2_r</td>
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<td>630</td>
<td>96</td>
<td>399</td>
<td>631</td>
<td>399</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>96</td>
<td>581</td>
<td>178</td>
<td>581</td>
<td>178</td>
<td>96</td>
<td>581</td>
<td>178</td>
<td>581</td>
</tr>
</tbody>
</table>

### 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/lib/ia32:/mnt/ramdisk/cpu2017-1.1.7-ic2021.1/je5.0.1-32"

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

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)

(Continued on next page)
**Dell Inc.**

**PowerEdge C6520 (Intel Xeon Gold 5318S, 2.10 GHz)**

**SPEC CPU®2017 Integer Rate Result**

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<td>327</td>
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**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** May-2021

**Tested by:** Dell Inc.

**Hardware Availability:** Apr-2021

**Software Availability:** Dec-2020

---

**General Notes (Continued)**

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 Sat May 22 18:51:54 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 5318S CPU @ 2.10GHz
- 2 "physical id"s (chips)
- 96 "processors"

cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

(Continued on next page)
Platform Notes (Continued)

cpu cores : 24
siblings : 48
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

From lscpu:
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              96
On-line CPU(s) list: 0-95
Thread(s) per core:  2
Core(s) per socket:  24
Socket(s):           2
NUMA node(s):        4
Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Gold 5318S CPU @ 2.10GHz
Stepping:            6
CPU MHz:             2636.100
BogoMIPS:            4200.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            36864K
NUMA node0 CPU(s):   0-11,48-59
NUMA node1 CPU(s):   12-23,60-71
NUMA node2 CPU(s):   24-35,72-83
NUMA node3 CPU(s):   36-47,84-95
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 aperf perfctr pni pclmulqdq dtes64 monitor ds_cpl vmx
   smx est tm2 ssse3 sdbg fma cx16 xtpmr 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_13 invpcid_single ssbd mba ibrs
   ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid fsgsbase
   tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a
   avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt
   avx512cd sha ni avx512bw avx512vl xsxveopt xsxvec xtgbvbx xsaves
   cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local wbinvd dtherm
   ida arat pln pts avx512v bmi umip kpu ospke
   avx512_vbmi2 gfn vaes vpcmrcrd pq vpcmqd avx512_vnni avx512_bitalg
   tme avx512_vpopcntdq 1a57 rdrpid md_clear pconf flush_l1d arch_capabilities

/proc/cpuinfo cache data
   cache size : 36864 KB

(Continued on next page)
Dell Inc.

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CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: May-2021
Hardware Availability: Apr-2021
Tested by: Dell Inc.
Software Availability: Dec-2020

Platform Notes (Continued)

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 48 49 50 51 52 53 54 55 56 57 58 59
node 0 size: 257436 MB
node 0 free: 257176 MB
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71
node 1 size: 258015 MB
node 1 free: 248401 MB
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 72 73 74 75 76 77 78 79 80 81 82 83
node 2 size: 258042 MB
node 2 free: 257834 MB
node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 258040 MB
node 3 free: 257707 MB
node distances:
node 0: 10 11 20 20
node 1: 11 10 20 20
node 2: 20 20 10 11
node 3: 20 20 10 10

From /proc/meminfo
MemTotal: 1056291272 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
(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

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PowerEdge C6520 (Intel Xeon Gold 5318S, 2.10 GHz)

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**CPU2017 License:** 55  
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---

**Platform Notes (Continued)**

**x86_64 x86_64 x86_64 GNU/Linux**

Kernel self-reported vulnerability status:

<table>
<thead>
<tr>
<th>CVE-2018-12207 (iTLB Multihit):</th>
<th>Not affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVE-2018-3620 (L1 Terminal Fault):</td>
<td>Not affected</td>
</tr>
<tr>
<td>Microarchitectural Data Sampling:</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2017-5754 (Meltdown):</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2018-3639 (Speculative Store Bypass):</td>
<td>Mitigation: Speculative Store Bypass disabled via prctl and seccomp</td>
</tr>
<tr>
<td>CVE-2017-5753 (Spectre variant 1):</td>
<td>Mitigation: usercopy/swapgs barriers and __user pointer sanitization</td>
</tr>
<tr>
<td>CVE-2017-5715 (Spectre variant 2):</td>
<td>Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling</td>
</tr>
<tr>
<td>CVE-2020-0543 (Special Register Buffer Data Sampling):</td>
<td>No status reported</td>
</tr>
<tr>
<td>CVE-2019-11135 (TSX Asynchronous Abort):</td>
<td>Not affected</td>
</tr>
</tbody>
</table>

**run-level 3 May 22 18:33**

**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>
</thead>
<tbody>
<tr>
<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>4.4G</td>
<td>121G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

**From /sys/devices/virtual/dmi/id**

<table>
<thead>
<tr>
<th>Vendor:</th>
<th>Dell Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product:</td>
<td>PowerEdge C6520</td>
</tr>
<tr>
<td>Product Family:</td>
<td>PowerEdge</td>
</tr>
<tr>
<td>Serial:</td>
<td>SDPT078</td>
</tr>
</tbody>
</table>

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 2933

**BIOS:**

<table>
<thead>
<tr>
<th>BIOS Vendor:</th>
<th>Dell Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOS Version:</td>
<td>1.1.3</td>
</tr>
<tr>
<td>BIOS Date:</td>
<td>04/27/2021</td>
</tr>
<tr>
<td>BIOS Revision:</td>
<td>1.1</td>
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</table>

(End of data from sysinfo program)
**Compiler Version Notes**

```
C    | 500.perlbench_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    | 502.gcc_r(peak)
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

```
C    | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
      | 525.x264_r(base, peak) 557.xz_r(base, peak)
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113

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

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

---

```
C       | 500.perlbench_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       | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

---

```
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
| 525.x264_r(base, peak) 557.xz_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++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
| 531.deepsjeng_r(base, peak) 541.leela_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.
```

---

```
Fortran | 548.exchange2_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.
```

---
### SPEC CPU®2017 Integer Rate Result

- **Dell Inc.**
  - PowerEdge C6520 (Intel Xeon Gold 5318S, 2.10 GHz)
  - **SPECrate®2017_int_base = 316**
  - **SPECrate®2017_int_peak = 327**

#### CPU2017 License:
- 55

#### Test Sponsor:
- Dell Inc.

#### Tested by:
- Dell Inc.

#### Base Compiler Invocation

- **C benchmarks:**
  - icx

- **C++ benchmarks:**
  - icpx

- **Fortran benchmarks:**
  - ifort

#### Base Portability Flags

- 500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
- 502.gcc_r: -DSPEC_LP64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

#### Base Optimization Flags

- **C benchmarks:**
  - -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
  - -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
  - -mbranches-within-32B-boundaries
  - -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
  - -lqkmalloc

- **C++ benchmarks:**
  - -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
  - -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
  - -mbranches-within-32B-boundaries
  - -L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
  - -lqkmalloc

- **Fortran benchmarks:**
  - -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
  - -qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
  - -auto -mbranches-within-32B-boundaries

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

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Hardware Availability: Apr-2021
Software Availability: Dec-2020

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

Peak Compiler Invocation

C benchmarks (except as noted below):
icx
500.perlbench_r: icc

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:
500.perlbench_r: -W1, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

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

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_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
# SPEC CPU®2017 Integer Rate Result

Dell Inc.  

PowerEdge C6520 (Intel Xeon Gold 5318S, 2.10 GHz)  

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.7 on 2021-05-22 18:51:52-0400.  
Report generated on 2021-07-08 13:30:01 by CPU2017 PDF formatter v6442.  
Originally published on 2021-07-06.