## Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>325</th>
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<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>339</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Nov-2021  
**Hardware Availability:** Apr-2019  
**Software Availability:** Dec-2020

| SPECrate®2017_int_peak | 339 |

### Hardware

- **CPU Name:** Intel Xeon Gold 6238R  
- **Max MHz:** 4000  
- **Nominal:** 2200  
- **Enabled:** 56 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:** 38.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)  
- **Storage:** 125 GB on tmpfs  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)  
  4.18.0-240.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 2.13.1 released Nov-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.

<table>
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### SPEC CPU®2017 Integer Rate Result

- **500.perlbench_r**  
- **502.gcc_r**  
- **505.mcf_r**  
- **520.omnetpp_r**  
- **523.xalancbmk_r**  
- **525.x264_r**  
- **531.deepsjeng_r**  
- **541.leela_r**  
- **548.exchange2_r**  
- **557.xz_r**
Results Table

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</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/cpu2017-1.1.8-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.8-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
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

(Continued on next page)
**General Notes (Continued)**

runcpu command invoked through numaclt 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  

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.

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  
  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 982a61ec0915b55891ef0e16acafec64d  
running on localhost.localdomain Tue Nov  9 13:23:03 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 6238R CPU @ 2.20GHz  
    2 "physical id"s (chips)  
    112 "processors"  
  cores, siblings (Caution: counting these is hw and system dependent. The following

(Continued on next page)
**Dell Inc.**  
**PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)**

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** Nov-2021  
**Hardware Availability:** Apr-2019  
**Tested by:** Dell Inc.  
**Software Availability:** Dec-2020

**SPEC CPU®2017 Integer Rate Result**

### SPEC Rate

**SPECrate®2017_int_base** = 325  
**SPECrate®2017_int_peak** = 339

---

### Platform Notes (Continued)

excerpts from `/proc/cpuinfo might not be reliable. Use with caution.)

cpu cores : 28  
siblings : 56

physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27  
28 29 30  
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27  
28 29 30

From `lscpu` from `util-linux 2.32.1`:

- **Architecture:** x86_64  
- **CPU op-mode(s):** 32-bit, 64-bit  
- **Byte Order:** Little Endian  
- **CPU(s):** 112  
- **On-line CPU(s) list:** 0-111

**Thread(s) per core:** 2  
**Core(s) per socket:** 28  
**Socket(s):** 2  
**NUMA node(s):** 4

**Vendor ID:** GenuineIntel  
**CPU family:** 6  
**Model:** 85  
**Model name:** Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz  
**Stepping:** 7  
**CPU MHz:** 3201.764  
**CPU max MHz:** 4000.0000  
**CPU min MHz:** 1000.0000  
**BogoMIPS:** 4400.00

**Virtualization:** VT-x

**L1d cache:** 32K  
**L1i cache:** 32K  
**L2 cache:** 1024K  
**L3 cache:** 39424K

**NUMA node0 CPU(s):** 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108  
**NUMA node1 CPU(s):** 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109  
**NUMA node2 CPU(s):** 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102,106,110  
**NUMA node3 CPU(s):** 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71,75,79,83,87,91,95,99,103,107,111

**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 aperfmperf 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 cdp_cpl invpcid_single intel_pni ssbd mba ibrs ibpb stibp ibrs enhanced fsgsbase tsc_adjust

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

Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPECrate®2017_int_base = 325
SPECrate®2017_int_peak = 339

CPU2017 License: 55
Test Date: Nov-2021
Test Sponsor: Dell Inc.
Hardware Availability: Apr-2019
Tested by: Dell Inc.
Software Availability: Dec-2020

Platform Notes (Continued)

bmi1 hle avx2 smep bmi2 erms invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap
clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsave
.cgq llc cgq_occup_llc cgq_mbm_total cgq_mbm_local dtherm ida arat pln pts pku ospke
avx512_vnni md_clear flush_lld arch_capabilities

/proc/cpuinfo cache data
  cache size : 39424 KB

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 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96
  100 104 108
node 0 size: 89606 MB
node 0 free: 94950 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97
  101 105 109
node 1 size: 91113 MB
node 1 free: 87333 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98
  102 106 110
node 2 size: 91365 MB
node 2 free: 96058 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99
  103 107 111
node 3 size: 91860 MB
node 3 free: 96559 MB
node distances:
  node 0: 10 21 11 21
  1: 21 10 21 11
  2: 11 21 10 21
  3: 21 11 21 10

From /proc/meminfo
MemTotal: 394802948 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance
/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

From /etc/*release* /etc/*version*
os-release:

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)  

**Spec CPU®2017 Integer Rate Result**

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrater®2017_int_base = 325
SPECrater®2017_int_peak = 339

---

**Platform Notes (Continued)**

```plaintext
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga
```

uname -a:
```
Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **CVE-2018-12207 (iTLB Multihit):**  
  KVM: Mitigation: Split huge pages
- **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/swapgs barriers and __user pointer sanitization
- **CVE-2017-5753 (Spectre variant 1):**  
  Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
- **CVE-2017-5715 (Spectre variant 2):**  
  Not affected
- **CVE-2020-0543 (Special Register Buffer Data Sampling):**  
  Not affected
- **CVE-2019-11135 (TSX Asynchronous Abort):**  
  Mitigation: TSX disabled

run-level 3 Nov 9 13:07

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

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<th>Filesystem</th>
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<th>Size</th>
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<th>Use%</th>
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<td>tmpfs</td>
<td>tmpfs</td>
<td>125G</td>
<td>4.4G</td>
<td>121G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
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</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 C6420</td>
</tr>
<tr>
<td>Product Family:</td>
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</tbody>
</table>

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

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

**Dell Inc.**

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

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**SPECrate®2017_int_base = 325**

**SPECrate®2017_int_peak = 339**

**Platform Notes (Continued)**

frequent changes to hardware, firmware, and the "DMTF SMBOIS" standard.

**Memory:**

- 7x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 2x 00AD062000AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 3x 00AD069000AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
- 4x Not Specified Not Specified

**BIOS:**

- BIOS Vendor: Dell Inc.
- BIOS Version: 2.13.1
- BIOS Date: 11/03/2021
- BIOS Revision: 2.13

(End of data from sysinfo program)

**Compiler Version Notes**

```
C     | 500.perlbench_r(peak) 557.xz_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)
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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```
C     | 500.perlbench_r(peak) 557.xz_r(peak)
```

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) (Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

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| Test Sponsor: | Dell Inc. |
| Test Date: | Nov-2021 |
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| Software Availability: | Dec-2020 |

**SPECrates**

- **SPECrates**
  - SPECrates\_2017\_int\_peak = 339
  - SPECrates\_2017\_int\_base = 325

**Compiler Version Notes (Continued)**

64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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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.

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

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.

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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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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) |
|-----------------|-------------------|-----------------|-------------------|-------------------|

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
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(Continued on next page)
## Dell Inc.

PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 325</th>
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<td>CPU2017 License: 55</td>
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### Compiler Version Notes (Continued)

#### C++

<table>
<thead>
<tr>
<th>Compiler</th>
<th>Flags</th>
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</tr>
</thead>
<tbody>
<tr>
<td>icx</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
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</table>

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

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#### Fortran

<table>
<thead>
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<tbody>
<tr>
<td>ifort</td>
<td>-DSPEC_LP64</td>
<td></td>
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</tbody>
</table>

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

**Dell Inc.**

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### 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`  
- `-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`

- `557.xz_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`

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SPEC CPU®2017 Integer Rate Result
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Peak Portability Flags (Continued)

520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leeL_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -Wl,-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

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: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-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:

520.omnetpp_r: basepeak = yes

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### Peak Optimization Flags (Continued)

- 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:


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