Dell Inc.

PowerEdge R650 (Intel Xeon Gold 5317, 3.00 GHz)

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

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

---

**Copies**

| SPECrate®2017_int_base = 201 |
| SPECrate®2017_int_peak = 209 |

| Test Date: | Jun-2021 |
| Hardware Availability: | Jun-2021 |
| Software Availability: | Feb-2021 |

<table>
<thead>
<tr>
<th>Hardware</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU Name:</strong> Intel Xeon Gold 5317</td>
</tr>
<tr>
<td><strong>Max MHz:</strong> 3600</td>
</tr>
<tr>
<td><strong>Nominal:</strong> 3000</td>
</tr>
<tr>
<td><strong>Enabled:</strong> 24 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td><strong>Orderable:</strong> 1.2 chips</td>
</tr>
<tr>
<td><strong>Cache L1:</strong> 32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td><strong>L2:</strong> 1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td><strong>L3:</strong> 18 MB I+D on chip per chip</td>
</tr>
<tr>
<td><strong>Other:</strong> None</td>
</tr>
<tr>
<td><strong>Memory:</strong> 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)</td>
</tr>
<tr>
<td><strong>Storage:</strong> 225 GB on tmpfs</td>
</tr>
<tr>
<td><strong>Other:</strong> None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OS:</strong> Red Hat Enterprise Linux 8.3 (Ootpa) 4.18.0-240.15.1.el8_3.x86_64</td>
</tr>
<tr>
<td><strong>Compiler:</strong> 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</td>
</tr>
<tr>
<td><strong>Parallel:</strong> No</td>
</tr>
<tr>
<td><strong>Firmware:</strong> Version 1.2.4 released May-2021</td>
</tr>
<tr>
<td><strong>File System:</strong> tmpfs</td>
</tr>
<tr>
<td><strong>System State:</strong> Run level 5 (graphical multi-user)</td>
</tr>
<tr>
<td><strong>Base Pointers:</strong> 64-bit</td>
</tr>
<tr>
<td><strong>Peak Pointers:</strong> 32/64-bit</td>
</tr>
<tr>
<td><strong>Other:</strong> jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td><strong>Power Management:</strong> BIOS and OS set to prefer performance at the cost of additional power usage.</td>
</tr>
</tbody>
</table>
## 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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<tbody>
<tr>
<td>500.perlbench_r</td>
<td>48</td>
<td>559</td>
<td>137</td>
<td>560</td>
<td>136</td>
<td>48</td>
<td>478</td>
<td>160</td>
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<tr>
<td>502.gcc_r</td>
<td>48</td>
<td>410</td>
<td>166</td>
<td>413</td>
<td>165</td>
<td>48</td>
<td>356</td>
<td>191</td>
<td>191</td>
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<tr>
<td>505.mcf_r</td>
<td>48</td>
<td>222</td>
<td>349</td>
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<td>347</td>
<td>48</td>
<td>222</td>
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<td>347</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>48</td>
<td>489</td>
<td>129</td>
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<td>129</td>
<td>48</td>
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</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>48</td>
<td>198</td>
<td>257</td>
<td>197</td>
<td>258</td>
<td>48</td>
<td>198</td>
<td>257</td>
<td>258</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>48</td>
<td>201</td>
<td>419</td>
<td>200</td>
<td>419</td>
<td>48</td>
<td>191</td>
<td>440</td>
<td>438</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>48</td>
<td>362</td>
<td>152</td>
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<td>152</td>
<td>48</td>
<td>362</td>
<td>152</td>
<td>152</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>48</td>
<td>533</td>
<td>149</td>
<td>534</td>
<td>149</td>
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<td>533</td>
<td>149</td>
<td>149</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>48</td>
<td>305</td>
<td>412</td>
<td>308</td>
<td>408</td>
<td>48</td>
<td>305</td>
<td>412</td>
<td>408</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>48</td>
<td>473</td>
<td>110</td>
<td>470</td>
<td>110</td>
<td>48</td>
<td>473</td>
<td>110</td>
<td>110</td>
</tr>
</tbody>
</table>

**SPECrate®2017_int_base = 201**  
**SPECrate®2017_int_peak = 209**  

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/cpu2017-1.1.5-ic2021.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.5-ic2021.1/lib/ia32:/mnt/ramdisk/cpu2017-1.1.5-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 numactl i.e.:
```bash
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 225 GB ramdisk created with the cmd: "mount -t tmpfs -o size=225G 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/cpu2017-1.1.5-ic2021.1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Fri Jun  4 09:28:40 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)
- 48 "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

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

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SPECrate®2017_int_peak = 209

CPU2017 License: 55
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Hardware Availability: Jun-2021
Software Availability: Feb-2021

Platform Notes (Continued)

siblings : 24
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:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5317 CPU @ 3.00GHz
Stepping: 6
CPU MHz: 3594.383
BogoMIPS: 6000.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 18432K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44
NUMA node1 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46
NUMA node2 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47
Flags: fpu vme de pse tsc msr pae mce 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 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 invpcid_single intel_pni ssbd mbz ibrs ibpb stibp ibrs_enhanced fsmsbase tscking_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512vdsha ni avx512bv1 avx512bw avx512vl xsaveopt xsaves xsavec xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local split_lock_detect wbinvd dtherm idate arat lni pln pste avx512vmbmi umip pkup kusu ospe avx512_vmbmi2 gfi vaes vplcmulqdq avx512_mulvni avx512_bitalg tme avx512_vpoppcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/platform/cpuinfo cache data

cache size : 18432 KB

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

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---

**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 4 8 12 16 20 24 28 32 36 40 44
node 0 size: 127015 MB
node 0 free: 113393 MB
node 1 cpus: 2 6 10 14 18 22 26 30 34 38 42 46
node 1 size: 127417 MB
node 1 free: 128275 MB
node 2 cpus: 1 5 9 13 17 21 25 29 33 37 41 45
node 2 size: 127446 MB
node 2 free: 128149 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47
node 3 size: 127412 MB
node 3 free: 128336 MB
node distances:
 node 0 1 2 3
 0: 10 11 20 20
 1: 11 10 20 20
 2: 20 20 11 10
 3: 20 20 11 10

From `/proc/meminfo`

```
MemTotal:       527811432 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="8.3 (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 4.18.0-240.15.1.el8_3.x86_64 #1 SMP Wed Feb 3 03:12:15 EST 2021 x86_64 x86_64 x86_64 GNU/Linux
```
Platform Notes (Continued)

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: 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): Not affected

run-level 5 Jun 4 09:25

SPEC is set to: /mnt/ramdisk/cpu2017-1.1.5-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>225G</td>
<td>6.9G</td>
<td>219G</td>
<td>4%</td>
<td>/mnt/ramdisk</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

Vendor: Dell Inc.
Product: PowerEdge R650
Product Family: PowerEdge
Serial: 1234567

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:

7x 00AD00B300AD HMAA4GR7A9R8N-XN 32 GB 2 rank 3200, configured at 2933
9x 00AD063200AD HMAA4GR7A9R8N-XN 32 GB 2 rank 3200, configured at 2933
16x Not Specified Not Specified

BIOS:

BIOS Vendor: Dell Inc.
BIOS Version: 1.2.4
BIOS Date: 05/28/2021
BIOS Revision: 1.2

(End of data from sysinfo program)
**SPEC CPU®2017 Integer Rate Result**

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---

**Compiler Version Notes**

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

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

---

---

(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.
Dell Inc.
PowerEdge R650 (Intel Xeon Gold 5317, 3.00 GHz)

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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.xalanchmk_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
-f1to -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 -f1to
-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)
## Dell Inc.

**PowerEdge R650 (Intel Xeon Gold 5317, 3.00 GHz)**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_base</td>
<td>201</td>
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### CPU2017 License

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### Test Sponsor

Dell Inc.

### Tested by

Dell Inc.

### Test Date

Jun-2021

### Hardware Availability

Jun-2021

### Software Availability

Feb-2021

## 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):**

- `icc`
- `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: -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`

*(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
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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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