



# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8460Y+)

CPU2017 License: 6573

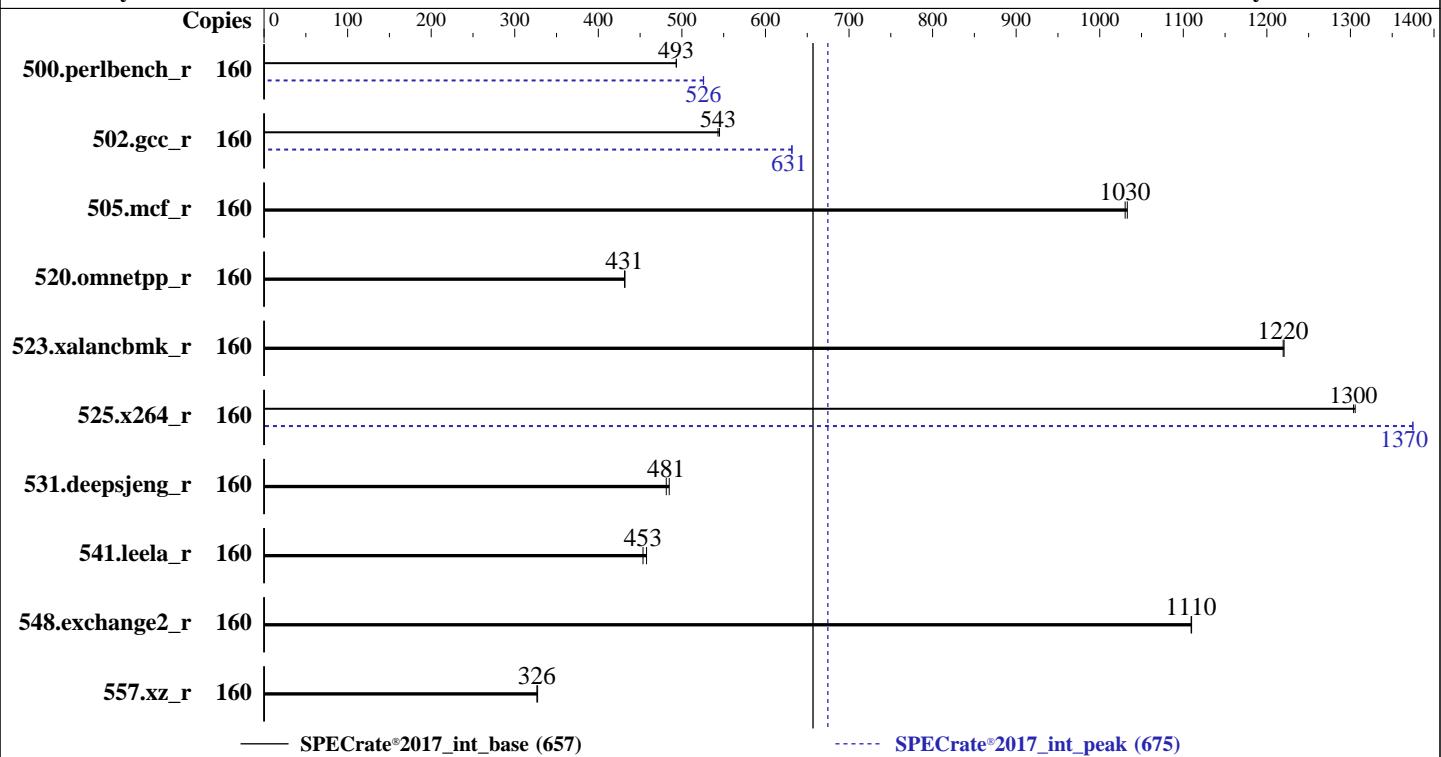
Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Dec-2022

Hardware Availability: Feb-2023

Software Availability: Nov-2022



## Hardware

CPU Name: Intel Xeon Platinum 8460Y+  
 Max MHz: 3700  
 Nominal: 2000  
 Enabled: 80 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 2 MB I+D on chip per core  
 L3: 105 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)  
 Storage: 125 GB on tmpfs  
 Other: None

## Software

OS: Red Hat Enterprise Linux 8.7 (Ootpa)  
 4.18.0-425.3.1.el8.x86\_64  
 Compiler: C/C++: Version 2022.1 of Intel oneAPI DPC++/C++  
 Compiler for Linux;  
 Fortran: Version 2022.1 of Intel Fortran Compiler  
 for Linux;  
 Parallel: No  
 Firmware: Version 0.3.2 released Nov-2022  
 File System: tmpfs  
 System State: Run level 5 (graphical 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.



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## Results Table

Benchmark	Base								Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	160	<b>516</b>	<b>493</b>	516	493			160	<b>485</b>	<b>526</b>	484	526				
502.gcc_r	160	<b>417</b>	<b>543</b>	416	545			160	359	632	<b>359</b>	<b>631</b>				
505.mcf_r	160	<b>251</b>	<b>1030</b>	250	1030			160	<b>251</b>	<b>1030</b>	250	1030				
520.omnetpp_r	160	486	432	<b>487</b>	<b>431</b>			160	486	432	<b>487</b>	<b>431</b>				
523.xalancbmk_r	160	<b>139</b>	<b>1220</b>	138	1220			160	<b>139</b>	<b>1220</b>	138	1220				
525.x264_r	160	<b>215</b>	<b>1300</b>	215	1310			160	204	1370	<b>204</b>	<b>1370</b>				
531.deepsjeng_r	160	<b>381</b>	<b>481</b>	378	485			160	<b>381</b>	<b>481</b>	378	485				
541.leela_r	160	579	458	<b>584</b>	<b>453</b>			160	579	458	<b>584</b>	<b>453</b>				
548.exchange2_r	160	378	1110	<b>378</b>	<b>1110</b>			160	378	1110	<b>378</b>	<b>1110</b>				
557.xz_r	160	528	327	<b>529</b>	<b>326</b>			160	528	327	<b>529</b>	<b>326</b>				

SPECrate®2017\_int\_base = 657

SPECrate®2017\_int\_peak = 675

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

## Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk\_r / 623.xalancbmk\_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 [https://www.spec.org/cpu2017/Docs/runrules.html#rule\\_1.4](https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4)), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

## 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-ic2022.1/lib/intel64:/mnt/ramdisk/cpu2017-1.1.8-ic2022.1/lib/ia32:/mnt/ram
  disk/cpu2017-1.1.8-ic2022.1/je5.0.1-32"
MALLOC_CONF = "retain:true"
```



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## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4

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

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

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:

```
        ADDDC Setting : Disabled
        DIMM Self Healing on
        Uncorrectable Memory Error : Disabled
        Virtualization Technology : Disabled
            Sub NUMA Cluster : 4-way Clustering
        DCU Streamer Prefetcher : Disabled
            LLC Prefetch : Disabled
        Dead Line LLC Alloc : Disabled
            Optimizer Mode : Enabled

        System Profile : Custom
        CPU Power Management : Maximum Performance
            C1E : Disabled
            C States : Autonomous
        Memory Patrol Scrub : Disabled
        Energy Efficiency Policy : Performance
            PCI ASPM L1 Link
            Power Management : Disabled
```

Sysinfo program /mnt/ramdisk/cpu2017-1.1.8-ic2022.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Sat Dec 3 06:28:34 2022

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) Platinum 8460Y+
  2 "physical id"s (chips)
  160 "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 : 40
```

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## Platform Notes (Continued)

```
siblings : 80
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 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
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 24
25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
```

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):                160
On-line CPU(s) list:  0-159
Thread(s) per core:   2
Core(s) per socket:   40
Socket(s):             2
NUMA node(s):          8
Vendor ID:             GenuineIntel
BIOS Vendor ID:       Intel
CPU family:            6
Model:                 143
Model name:            Intel(R) Xeon(R) Platinum 8460Y+
BIOS Model name:      Intel(R) Xeon(R) Platinum 8460Y+
Stepping:              8
CPU MHz:               2000.000
BogoMIPS:              4000.00
L1d cache:             48K
L1i cache:             32K
L2 cache:              2048K
L3 cache:              107520K
NUMA node0 CPU(s):    0,4,8,12,16,20,24,28,32,36,80,84,88,92,96,100,104,108,112,116
NUMA node1 CPU(s):    40,44,48,52,56,60,64,68,72,76,120,124,128,132,136,140,144,148,152,156
NUMA node2 CPU(s):    2,6,10,14,18,22,26,30,34,38,82,86,90,94,98,102,106,110,114,118
NUMA node3 CPU(s):    42,46,50,54,58,62,66,70,74,78,122,126,130,134,138,142,146,150,154,158
NUMA node4 CPU(s):    1,5,9,13,17,21,25,29,33,37,81,85,89,93,97,101,105,109,113,117
NUMA node5 CPU(s):    41,45,49,53,57,61,65,69,73,77,121,125,129,133,137,141,145,149,153,157
NUMA node6 CPU(s):    3,7,11,15,19,23,27,31,35,39,83,87,91,95,99,103,107,111,115,119
NUMA node7 CPU(s):    43,47,51,55,59,63,67,71,75,79,123,127,131,135,139,143,147,151,155,159
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 nopl xtTopology nonstop_tsc cpuid
aperfmpf perf tsc_known_freq pn1 pclmulqdq dtes64 monitor ds_cpl smx est tm2 ssse3 sdbg
fma cx16 xptr 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 cat_12 cdp_13
invpcid_single cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust
bmil avx2 smep bmi2 erms invpcid cqmq rdt_a avx512f avx512dq rdseed adx smap
avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt
xsavec xgetbyl xsaves cqmq_llc cqmq_occu_llc cqmq_mbmb_total cqmq_mbmb_local
split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hfi
avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni
avx512_bitalg tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri
movdir64b enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr amx_bf16
avx512_fp16 amx_tile amx_int8 flush_l1d arch_capabilities
```

```
/proc/cpuinfo cache data
cache size : 107520 KB
```

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## Platform Notes (Continued)

From numactl --hardware

WARNING: a numactl 'node' might or might not correspond to a physical chip.  
available: 8 nodes (0-7)  
node 0 cpus: 0 4 8 12 16 20 24 28 32 36 80 84 88 92 96 100 104 108 112 116  
node 0 size: 128216 MB  
node 0 free: 127916 MB  
node 1 cpus: 40 44 48 52 56 60 64 68 72 76 120 124 128 132 136 140 144 148 152 156  
node 1 size: 129019 MB  
node 1 free: 128730 MB  
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 82 86 90 94 98 102 106 110 114 118  
node 2 size: 129019 MB  
node 2 free: 121381 MB  
node 3 cpus: 42 46 50 54 58 62 66 70 74 78 122 126 130 134 138 142 146 150 154 158  
node 3 size: 129019 MB  
node 3 free: 128679 MB  
node 4 cpus: 1 5 9 13 17 21 25 29 33 37 81 85 89 93 97 101 105 109 113 117  
node 4 size: 129019 MB  
node 4 free: 128761 MB  
node 5 cpus: 41 45 49 53 57 61 65 69 73 77 121 125 129 133 137 141 145 149 153 157  
node 5 size: 129019 MB  
node 5 free: 128711 MB  
node 6 cpus: 3 7 11 15 19 23 27 31 35 39 83 87 91 95 99 103 107 111 115 119  
node 6 size: 128977 MB  
node 6 free: 127455 MB  
node 7 cpus: 43 47 51 55 59 63 67 71 75 79 123 127 131 135 139 143 147 151 155 159  
node 7 size: 129007 MB  
node 7 free: 128745 MB  
node distances:  
node 0 1 2 3 4 5 6 7  
0: 10 12 12 12 21 21 21 21  
1: 12 10 12 12 21 21 21 21  
2: 12 12 10 12 21 21 21 21  
3: 12 12 12 10 21 21 21 21  
4: 21 21 21 21 10 12 12 12  
5: 21 21 21 21 12 10 12 12  
6: 21 21 21 21 12 12 10 12  
7: 21 21 21 21 12 12 12 10

From /proc/meminfo

MemTotal: 1056050176 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="8.7 (Ootpa)"  
ID="rhel"  
ID\_LIKE="fedora"  
VERSION\_ID="8.7"  
PLATFORM\_ID="platform:el8"  
PRETTY\_NAME="Red Hat Enterprise Linux 8.7 (Ootpa)"  
ANSI\_COLOR="0;31"  
redhat-release: Red Hat Enterprise Linux release 8.7 (Ootpa)  
system-release: Red Hat Enterprise Linux release 8.7 (Ootpa)  
system-release-cpe: cpe:/o:redhat:enterprise\_linux:8::baseos

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## Platform Notes (Continued)

```
uname -a:  
Linux localhost.localdomain 4.18.0-425.3.1.el8.x86_64 #1 SMP Fri Sep 30 11:45:06 EDT  
2022 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
CVE-2017-5754 (Meltdown):	Not affected
mmio_stale_data:	Not affected
retbleed:	Not affected
CVE-2018-3639 (Speculative Store Bypass):	Mitigation: Speculative Store Bypass disabled via prctl
CVE-2017-5753 (Spectre variant 1):	Mitigation: usercopy/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling, PBRSB-eIBRS: SW sequence
CVE-2020-0543 (Special Register Buffer Data Sampling):	Not affected
CVE-2019-11135 (TSX Asynchronous Abort):	Not affected

run-level 5 Dec 3 06:26

```
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.8-ic2022.1  
Filesystem      Type   Size  Used Avail Use% Mounted on  
tmpfs          tmpfs  125G  3.6G  122G   3% /mnt/ramdisk
```

```
From /sys/devices/virtual/dmi/id  
Vendor:        Dell Inc.  
Product:       PowerEdge MX760c  
Product Family: PowerEdge  
Serial:        MWCFG04
```

Additional information from dmidecode 3.3 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 002C0632002C MTC40F2046S1RC48BA1 64 GB 2 rank 4800
```

```
BIOS:  
BIOS Vendor:    Dell Inc.  
BIOS Version:   0.3.2  
BIOS Date:      11/30/2022  
BIOS Revision:  0.3
```

(End of data from sysinfo program)

## Compiler Version Notes

```
=====  
C      | 502.gcc_r(peak)  
-----  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
=====
```

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## Compiler Version Notes (Continued)

```
=====  
C      | 500.perlbench_r(base, peak) 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 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
=====
```

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

```
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=====
```

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

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Copyright (C) 1985-2022 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 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
=====
```

```
=====  
Fortran | 548.exchange2_r(base, peak)
```

```
=====  
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
=====
```

## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx



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## 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  
-L/usr/local/intel/compiler/2022.1.0/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  
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-nostandard-realloc-lhs -align array32byte -auto  
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

## Peak Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx



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## 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: -w -std=c11 -m64 -Wl,-z,muldefs  
-fprofile-generate(pass 1)  
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512  
-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -fno-strict-overflow  
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64\_lin  
-lqkmalloc  
  
502.gcc\_r: -m32  
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/ia32\_lin  
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)  
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512  
-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -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 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -fno-alias  
-L/usr/local/intel/compiler/2022.1.0/linux/compiler/lib/intel64\_lin  
-lqkmalloc

557.xz\_r: basepeak = yes

C++ benchmarks:

(Continued on next page)



# SPEC CPU®2017 Integer Rate Result

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Dell Inc.

PowerEdge MX760c (Intel Xeon Platinum 8460Y+)

CPU2017 License: 6573

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

SPECrate®2017\_int\_base = 657

SPECrate®2017\_int\_peak = 675

Test Date: Dec-2022

Hardware Availability: Feb-2023

Software Availability: Nov-2022

## Peak Optimization Flags (Continued)

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

<http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64-revB.html>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64-revB.xml>

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.2.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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