



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

SPECrate®2017_int_base = 266

PowerEdge R740xd (Intel Xeon Gold 6246R, 3.40 GHz)

SPECrate®2017_int_peak = 276

CPU2017 License: 55

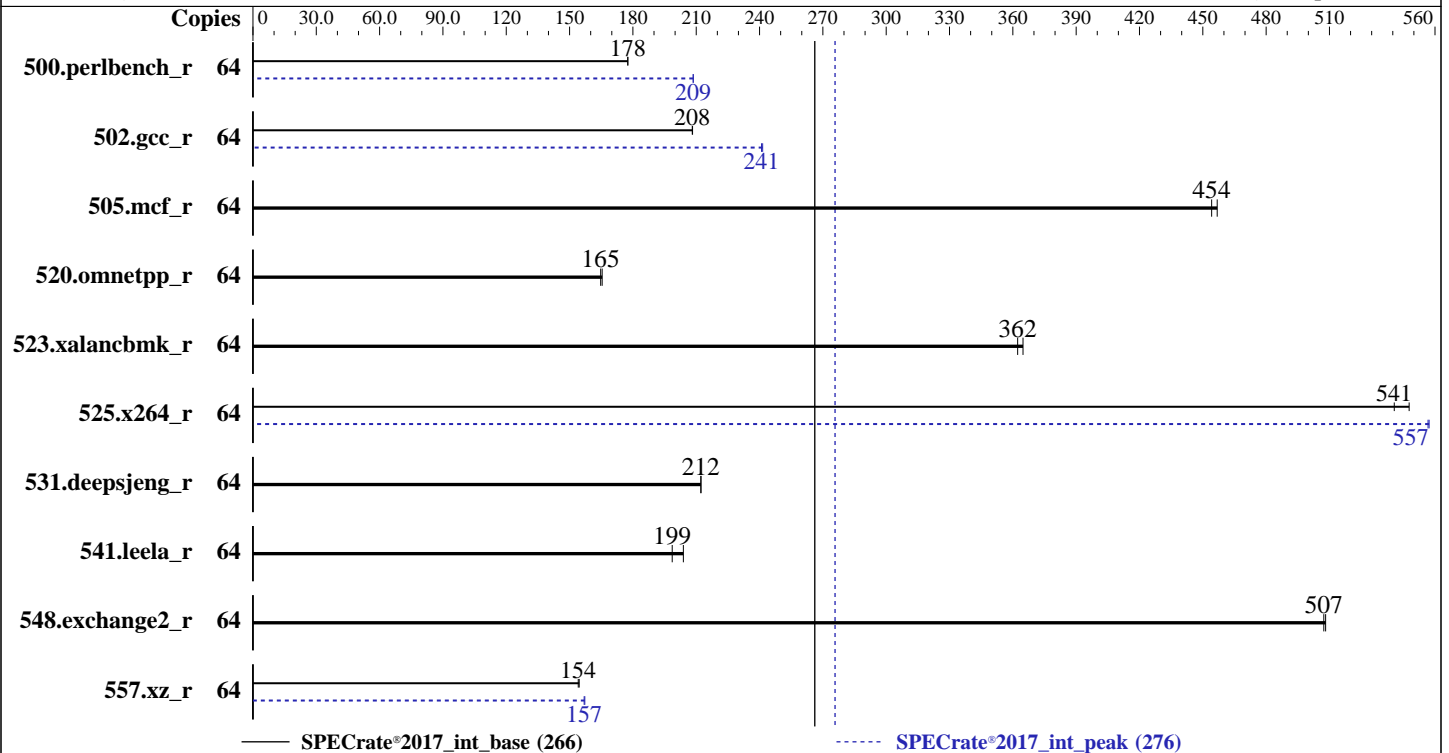
Test Date: Jun-2020

Test Sponsor: Dell Inc.

Hardware Availability: Jul-2020

Tested by: Dell Inc.

Software Availability: Apr-2020



Hardware

CPU Name: Intel Xeon Gold 6246R
 Max MHz: 4100
 Nominal: 3400
 Enabled: 32 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: 35.75 MB I+D on chip per chip
 Other: None
 Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933V-R, running at 2933)
 Storage: 1 x 1.92 TB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux 8.1
 kernel 4.18.0-147.el8.x86_64
 Compiler: C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux;
 Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
 Parallel: No
 Firmware: Version 2.7.7 released May-2020
 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 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
500.perlbench_r	64	574	178	<u>574</u>	<u>178</u>			64	<u>489</u>	<u>209</u>	488	209		
502.gcc_r	64	435	208	<u>435</u>	<u>208</u>			64	<u>376</u>	<u>241</u>	375	241		
505.mcf_r	64	226	457	<u>228</u>	<u>454</u>			64	226	457	<u>228</u>	<u>454</u>		
520.omnetpp_r	64	<u>510</u>	<u>165</u>	508	165			64	<u>510</u>	<u>165</u>	508	165		
523.xalancbmk_r	64	<u>187</u>	<u>362</u>	185	365			64	<u>187</u>	<u>362</u>	185	365		
525.x264_r	64	205	548	<u>207</u>	<u>541</u>			64	201	557	<u>201</u>	<u>557</u>		
531.deepsjeng_r	64	346	212	<u>346</u>	<u>212</u>			64	346	212	<u>346</u>	<u>212</u>		
541.leela_r	64	<u>534</u>	<u>199</u>	520	204			64	<u>534</u>	<u>199</u>	520	204		
548.exchange2_r	64	<u>331</u>	<u>507</u>	330	508			64	<u>331</u>	<u>507</u>	330	508		
557.xz_r	64	<u>449</u>	<u>154</u>	447	155			64	<u>441</u>	<u>157</u>	440	157		

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

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

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-ic19.lul/lib/intel64:/mnt/ramdisk/cpu2017-ic19.lul/lib/ia32:/mnt/ramdisk/cpu2017-ic19.lul/je5.0.1-32"
MALLOC_CONF = "retain:true"



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General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0

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>
```

Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"

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>

Platform Notes

BIOS settings:

- Sub NUMA Cluster enabled
- Virtualization Technology disabled
- System Profile set to Custom
- CPU Performance set to Maximum Performance
- C States set to Autonomous
- C1E disabled
- Uncore Frequency set to Dynamic
- Energy Efficiency Policy set to Performance
- Memory Patrol Scrub set to standard
- Logical Processor enabled
- CPU Interconnect Bus Link Power Management disabled
- PCI ASPM L1 Link Power Management disabled
- UPI Prefetch enabled
- LLC Prefetch disabled
- Dead Line LLC Alloc enabled
- Directory AtoS disabled

Sysinfo program /mnt/ramdisk/cpu2017-ic19.1u1/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
 running on user-pc.spa.lab Tue Jun 2 07:11:34 2020

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>

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Platform Notes (Continued)

From /proc/cpuinfo

```

model name : Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
 2 "physical id"s (chips)
 64 "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 : 16
siblings  : 32
physical 0: cores 0 1 2 3 4 5 6 13 16 17 18 19 21 24 28 29
physical 1: cores 0 1 2 6 12 13 16 17 18 19 21 25 26 27 28 29

```

From lscpu:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
CPU(s):                 64
On-line CPU(s) list:   0-63
Thread(s) per core:    2
Core(s) per socket:    16
Socket(s):              2
NUMA node(s):          4
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  85
Model name:             Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
Stepping:               7
CPU MHz:                3828.657
CPU max MHz:           4100.0000
CPU min MHz:           1200.0000
BogoMIPS:               6800.00
Virtualization:        VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               36608K
NUMA node0 CPU(s):     0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60
NUMA node1 CPU(s):     1,5,7,13,17,21,25,29,33,37,39,45,49,53,57,61
NUMA node2 CPU(s):     2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62
NUMA node3 CPU(s):     3,9,11,15,19,23,27,31,35,41,43,47,51,55,59,63
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 xtopology nonstop_tsc cpuid
aperfperf 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_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi

```

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Platform Notes (Continued)

flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

```
/proc/cpuinfo cache data
cache size : 36608 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
node 0 size: 192072 MB
node 0 free: 191478 MB
node 1 cpus: 1 5 7 13 17 21 25 29 33 37 39 45 49 53 57 61
node 1 size: 193532 MB
node 1 free: 193202 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62
node 2 size: 193507 MB
node 2 free: 183840 MB
node 3 cpus: 3 9 11 15 19 23 27 31 35 41 43 47 51 55 59 63
node 3 size: 193532 MB
node 3 free: 193314 MB
node distances:
node  0  1  2  3
  0:  10  21  11  21
  1:  21  10  21  11
  2:  11  21  10  21
  3:  21  11  21  10
```

```
From /proc/meminfo
MemTotal:      791188312 kB
HugePages_Total:      0
Hugepagesize:    2048 kB
```

```
From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
```

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Platform Notes (Continued)

```
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga
```

uname -a:

```
Linux user-pc.spa.lab 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019 x86_64
x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
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/swaps barriers and __user
pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional,
RSB filling
```

run-level 3 Jun 2 07:08 last=5

SPEC is set to: /mnt/ramdisk/cpu2017-ic19.lul

```
Filesystem Type Size Used Avail Use% Mounted on
tmpfs tmpfs 225G 4.2G 221G 2% /mnt/ramdisk
```

From /sys/devices/virtual/dmi/id

```
BIOS: Dell Inc. 2.7.7 05/04/2020
Vendor: Dell Inc.
Product: PowerEdge R740xd
Product Family: PowerEdge
Serial: F5BMCS2
```

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:

```
19x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
4x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
```

(End of data from sysinfo program)



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Compiler Version Notes

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

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
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) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

=====
C | 500.perlbench_r(peak) 557.xz_r(peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

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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)

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=====
C | 500.perlbench_r(peak) 557.xz_r(peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306

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Compiler Version Notes (Continued)

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

C | 502.gcc_r(peak)

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen Build 20200304

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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) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304

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

C | 500.perlbench_r(peak) 557.xz_r(peak)

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306

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) C++ Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304

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

Fortran | 548.exchange2_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306

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Base Compiler Invocation

C benchmarks:

icc

C++ benchmarks:

icpc

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:

```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:

```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:

```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-nostandard-realloc-lhs -align array32byte -auto  
-mbranches-within-32B-boundaries  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

Peak Compiler Invocation

C benchmarks:

icc

C++ benchmarks:

icpc

Fortran benchmarks:

ifort

Peak Portability Flags

```
500.perlbenc_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.perlbenc_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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

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Peak Optimization Flags (Continued)

502.gcc_r: -m32

```
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/ia32_lin  
-std=gnu89  
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries  
-Wl,-z,muldefs -fprofile-generate(pass 1)  
-fprofile-use=default.profddata(pass 2) -xCORE-AVX512 -flto  
-Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold  
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib  
-ljemalloc
```

505.mcf_r: basepeak = yes

525.x264_r: -m64 -qnextgen -std=c11

```
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries  
-Wl,-z,muldefs -xCORE-AVX512 -flto -O3 -ffast-math  
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/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/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

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

http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.html

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE11.html>



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SPECrate®2017_int_base = 266

PowerEdge R740xd (Intel Xeon Gold 6246R, 3.40 GHz)

SPECrate®2017_int_peak = 276

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Jun-2020

Hardware Availability: Jul-2020

Software Availability: Apr-2020

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

http://www.spec.org/cpu2017/flags/Intel-ic19.lul-official-linux64_revA.xml

<http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE11.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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