SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

New H3C Technologies Co., Ltd.

H3C UniServer R4900 G5 (Intel Xeon Gold 6346)

$SPECrate®2017\_int\_base = 280$

$SPECrate®2017\_int\_peak = 289$
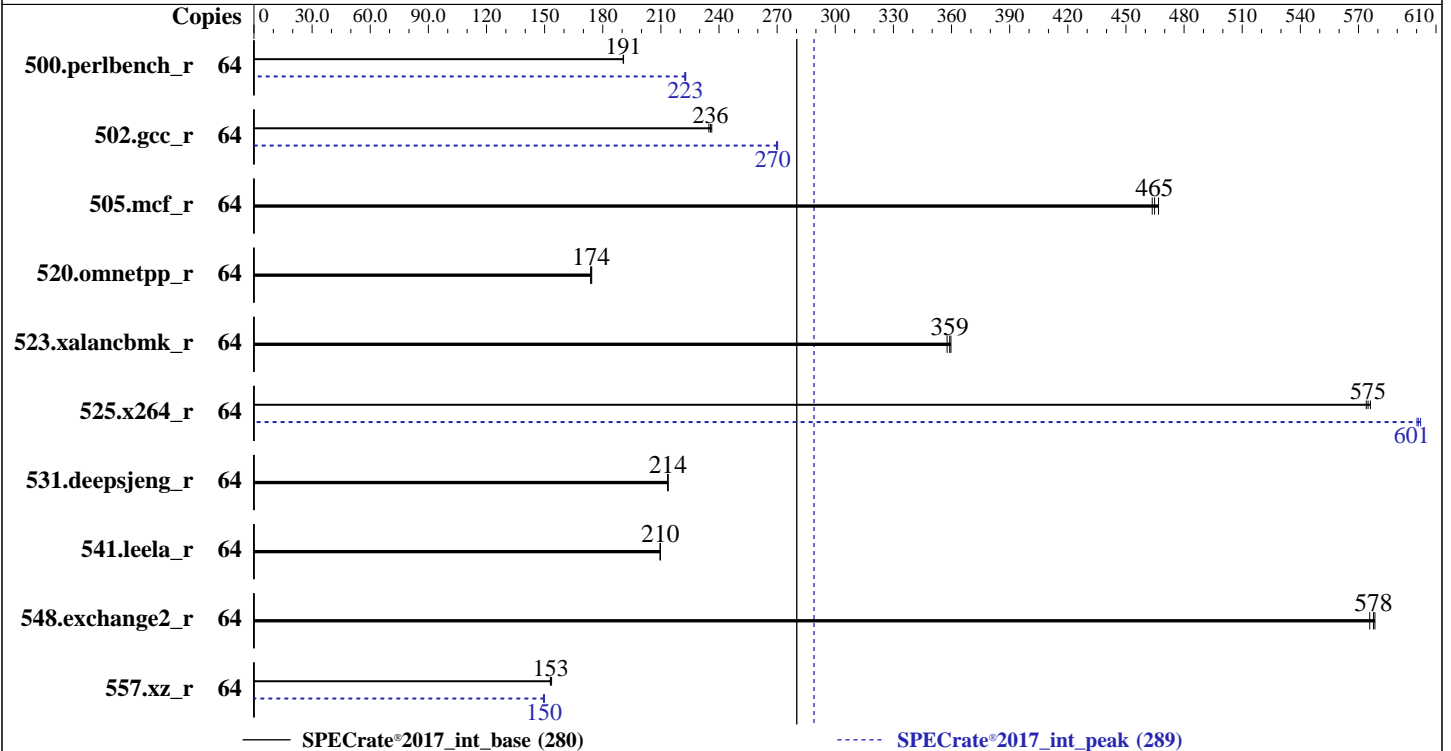
CPU2017 License: 9066　　　　　　　　　　　　　　　**Test Date:** Jun-2021
Test Sponsor: New H3C Technologies Co., Ltd.　　　**Hardware Availability:** Apr-2021
Tested by: New H3C Technologies Co., Ltd.　　　　**Software Availability:** Dec-2020

Benchmark	Copies	base	peak
500.perlbench_r	64	191	223
502.gcc_r	64	236	270
505.mcf_r	64	465	
520.omnetpp_r	64	174	
523.xalancbmk_r	64	359	
525.x264_r	64	575	601
531.deepsjeng_r	64	214	
541.leela_r	64	210	
548.exchange2_r	64	578	
557.xz_r	64	153	150

—— SPECrate®2017_int_base (280)　　　- - - - SPECrate®2017_int_peak (289)

Hardware

CPU Name: Intel Xeon Gold 6346
Max MHz: 3600
Nominal: 3100
Enabled: 32 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: 512 GB (16 x 32 GB 2Rx8 PC4-3200V-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 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 5.25 released May-2021
File System: xfs
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	**534**	**191**	534	191	535	191	64	457	223	458	222	**457**	**223**
502.gcc_r	64	384	236	386	235	**385**	**236**	64	336	270	335	270	**336**	**270**
505.mcf_r	64	222	467	**223**	**465**	223	464	64	222	467	**223**	**465**	223	464
520.omnetpp_r	64	**483**	**174**	483	174	482	174	64	**483**	**174**	483	174	482	174
523.xalancbmk_r	64	188	360	**188**	**359**	189	358	64	188	360	**188**	**359**	189	358
525.x264_r	64	195	576	**195**	**575**	195	574	64	186	602	**187**	**601**	187	600
531.deepsjeng_r	64	**343**	**214**	343	214	344	213	64	**343**	**214**	343	214	344	213
541.leela_r	64	**505**	**210**	505	210	506	210	64	**505**	**210**	505	210	506	210
548.exchange2_r	64	290	578	**290**	**578**	291	576	64	290	578	**290**	**578**	291	576
557.xz_r	64	452	153	450	154	**451**	**153**	64	**461**	**150**	461	150	463	149

SPECrate®2017_int_base =	**280**
SPECrate®2017_int_peak =	**289**

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 =
     "/home/spec2017/lib/intel64:/home/spec2017/lib/ia32:/home/spec2017/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 Redhat 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) is mitigated in the system as tested and documented.

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

New H3C Technologies Co., Ltd.

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CPU2017 License: 9066		**Test Date:**	Jun-2021
Test Sponsor:	New H3C Technologies Co., Ltd.	**Hardware Availability:**	Apr-2021
Tested by:	New H3C Technologies Co., Ltd.	**Software Availability:**	Dec-2020

General Notes (Continued)

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

Platform Notes

```
BIOS settings:
Set SNC to Enabled
Set Patrol Scrub to Disabled
Set XPT Prefetch to Enabled

Sysinfo program /home/spec2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Sat Jun  5 09:47:12 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 6346 CPU @ 3.10GHz
      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 7 8 9 10 11 12 13 14 15
      physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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):              64
     On-line CPU(s) list: 0-63
     Thread(s) per core:  2
     Core(s) per socket:  16
```

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Platform Notes (Continued)

```
        Socket(s):            2
        NUMA node(s):         4
        Vendor ID:            GenuineIntel
        CPU family:           6
        Model:                106
        Model name:           Intel(R) Xeon(R) Gold 6346 CPU @ 3.10GHz
        Stepping:             6
        CPU MHz:              3599.990
        CPU max MHz:          3600.0000
        CPU min MHz:          800.0000
        BogoMIPS:             6200.00
        Virtualization:       VT-x
        L1d cache:            48K
        L1i cache:            32K
        L2 cache:             1280K
        L3 cache:             36864K
        NUMA node0 CPU(s):    0-7,32-39
        NUMA node1 CPU(s):    8-15,40-47
        NUMA node2 CPU(s):    16-23,48-55
        NUMA node3 CPU(s):    24-31,56-63
        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
    aperfmperf pni pclmulqdq dtes64 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_ppin
    ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
    fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq
    rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw
    avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
    cqm_mbm_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku
    ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
    avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 36864 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 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39
    node 0 size: 126463 MB
    node 0 free: 127553 MB
    node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
    node 1 size: 126906 MB
    node 1 free: 128583 MB
    node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
```

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Platform Notes (Continued)

```
   node 2 size: 127098 MB
   node 2 free: 128466 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
   node 3 size: 127413 MB
   node 3 free: 128649 MB
   node distances:
   node   0   1   2   3
     0:  10  11  20  20
     1:  11  10  20  20
     2:  20  20  10  11
     3:  20  20  11  10

 From /proc/meminfo
    MemTotal:        527744776 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:
       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):                    Not affected
 CVE-2018-3620 (L1 Terminal Fault):                 Not affected
 Microarchitectural Data Sampling:                  Not affected
 CVE-2017-5754 (Meltdown):                          Not affected
```

(Continued on next page)

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Platform Notes (Continued)

```
CVE-2018-3639 (Speculative Store Bypass):                Mitigation: Speculative Store
                                                         Bypass disabled via prctl and
                                                         seccomp
CVE-2017-5753 (Spectre variant 1):                       Mitigation: usercopy/swapgs
                                                         barriers and __user pointer
                                                         sanitization
CVE-2017-5715 (Spectre variant 2):                       Mitigation: Enhanced IBRS, IBPB:
                                                         conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):                 Not affected


run-level 3 Jun 5 09:45


SPEC is set to: /home/spec2017
   Filesystem             Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   372G  100G  273G  27% /home


From /sys/devices/virtual/dmi/id
    Vendor:          New H3C Technologies Co., Ltd.
    Product:         H3C UniServer R4900 G5
    Product Family: Rack
    Serial:          210235A2RBH214000004


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
frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
  Memory:
    16x Micron 36ASF4G72PZ-3G2E7 32 GB 2 rank 3200
    16x NO DIMM NO DIMM


BIOS:
   BIOS Vendor:      American Megatrends International, LLC.
   BIOS Version:     5.25
   BIOS Date:        05/19/2021
   BIOS Revision:    5.22


(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
```

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Compiler Version Notes (Continued)

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


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

(Continued on next page)

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Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------
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
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.
--------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

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Base Compiler Invocation (Continued)

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
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

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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`
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`

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`

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https://www.spec.org/

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Peak Optimization Flags (Continued)

502.gcc_r (continued):
```
-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`

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-ic2021-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/New_H3C-Platform-Settings-V1.0-CPX-RevC.html

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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
http://www.spec.org/cpu2017/flags/New_H3C-Platform-Settings-V1.0-CPX-RevC.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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