SPEC CPU®2017 Integer Rate Result

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New H3C Technologies Co., Ltd.

H3C UniServer R4900 G3 (Intel Xeon Gold 6242R)

$SPECrate®2017\_int\_base = 294$

$SPECrate®2017\_int\_peak = 305$

CPU2017 License: 9066
Test Sponsor: New H3C Technologies Co., Ltd.
Tested by: New H3C Technologies Co., Ltd.

Test Date: Jun-2021
Hardware Availability: Mar-2020
Software Availability: Dec-2020

Copies		
500.perlbench_r	80	211 / 244
502.gcc_r	80	205 / 244
505.mcf_r	80	425
520.omnetpp_r	80	181
523.xalancbmk_r	80	358
525.x264_r	80	623 / 645
531.deepsjeng_r	80	249
541.leela_r	80	242
548.exchange2_r	80	593
557.xz_r	80	179 / 183

—— SPECrate®2017_int_base (294)   - - - - SPECrate®2017_int_peak (305)

Hardware

CPU Name: Intel Xeon Gold 6242R
 Max MHz: 4100
 Nominal: 3100
Enabled: 40 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: 384 GB (12 x 32 GB 2Rx8 PC4-2933V-R)
Storage: 1 x 1.6 TB SSD NVMe
Other: None

Software

OS: Red Hat Enterprise Linux release 8.2 (Ootpa) 4.18.0-193.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 2.00.48 released Mar-2021 BIOS
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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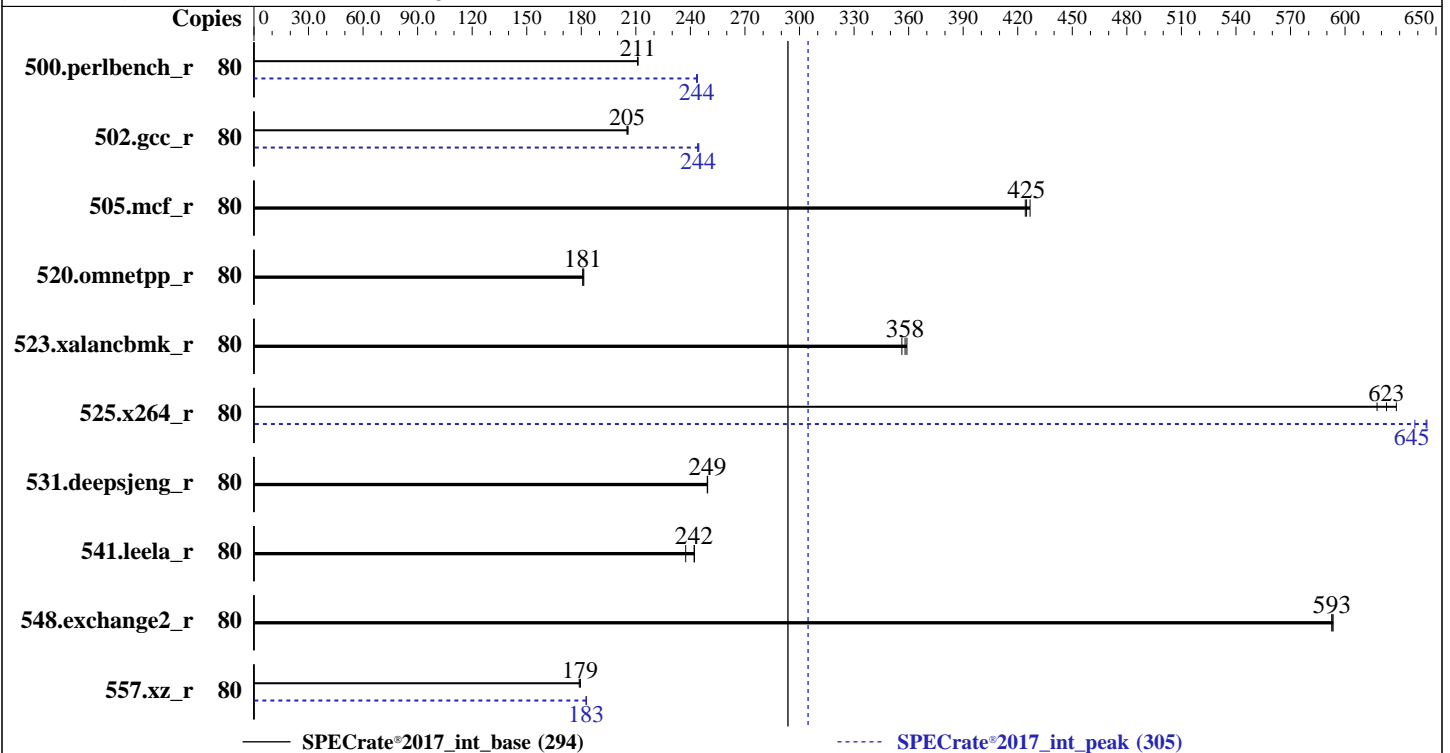| New H3C Technologies Co., Ltd.	SPECrate®2017_int_base = 294
H3C UniServer R4900 G3 (Intel Xeon Gold 6242R)	SPECrate®2017_int_peak = 305

CPU2017 License: 9066	**Test Date:** Jun-2021
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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	80	603	211	604	211	**604**	**211**	80	522	244	**523**	**244**	523	243
502.gcc_r	80	**552**	**205**	551	206	552	205	80	464	244	463	245	**464**	**244**
505.mcf_r	80	305	424	303	427	**304**	**425**	80	305	424	303	427	**304**	**425**
520.omnetpp_r	80	**580**	**181**	580	181	579	181	80	**580**	**181**	580	181	579	181
523.xalancbmk_r	80	**236**	**358**	237	356	235	359	80	**236**	**358**	237	356	235	359
525.x264_r	80	**225**	**623**	227	618	223	628	80	217	645	219	638	**217**	**645**
531.deepsjeng_r	80	368	249	**368**	**249**	367	249	80	368	249	**368**	**249**	367	249
541.leela_r	80	547	242	558	237	**547**	**242**	80	547	242	558	237	**547**	**242**
548.exchange2_r	80	353	593	354	593	**354**	**593**	80	353	593	354	593	**354**	**593**
557.xz_r	80	**482**	**179**	483	179	481	179	80	**473**	**183**	473	183	473	183
SPECrate®2017_int_base =	**294**											
SPECrate®2017_int_peak =	**305**											

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/speccpu/lib/intel64:/home/speccpu/lib/ia32:/home/speccpu/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)

New H3C Technologies Co., Ltd.

SPECrate®2017_int_base = 294

H3C UniServer R4900 G3 (Intel Xeon Gold 6242R)

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CPU2017 License: 9066		**Test Date:**	Jun-2021
Test Sponsor:	New H3C Technologies Co., Ltd.	**Hardware Availability:**	Mar-2020
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/speccpu/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Tue Jun 15 13:34:29 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 6242R CPU @ 3.10GHz
      2  "physical id"s (chips)
      80 "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 : 20
      siblings  : 40
      physical 0: cores 0 1 2 5 6 8 10 11 12 13 16 17 18 19 21 25 26 27 28 29
      physical 1: cores 0 1 2 3 5 6 10 11 12 13 16 17 18 19 21 24 26 27 28 29

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):              80
   On-line CPU(s) list: 0-79
   Thread(s) per core:  2
   Core(s) per socket:  20
```

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Platform Notes (Continued)

```
        Socket(s):              2
        NUMA node(s):           4
        Vendor ID:              GenuineIntel
        CPU family:             6
        Model:                  85
        Model name:             Intel(R) Xeon(R) Gold 6242R CPU @ 3.10GHz
        Stepping:               7
        CPU MHz:                3800.052
        CPU max MHz:            4100.0000
        CPU min MHz:            1200.0000
        BogoMIPS:               6200.00
        Virtualization:         VT-x
        L1d cache:              32K
        L1i cache:              32K
        L2 cache:               1024K
        L3 cache:               36608K
        NUMA node0 CPU(s):      0-2,5,6,10-12,15,16,40-42,45,46,50-52,55,56
        NUMA node1 CPU(s):      3,4,7-9,13,14,17-19,43,44,47-49,53,54,57-59
        NUMA node2 CPU(s):      20-23,26,30-32,35,36,60-63,66,70-72,75,76
        NUMA node3 CPU(s):      24,25,27-29,33,34,37-39,64,65,67-69,73,74,77-79
        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 cdp_l3 invpcid_single
    intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi 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 hwp hwp_act_window hwp_epp hwp_pkg_req 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 1 2 5 6 10 11 12 15 16 40 41 42 45 46 50 51 52 55 56
   node 0 size: 95084 MB
   node 0 free: 88375 MB
   node 1 cpus: 3 4 7 8 9 13 14 17 18 19 43 44 47 48 49 53 54 57 58 59
   node 1 size: 96735 MB
   node 1 free: 92544 MB
   node 2 cpus: 20 21 22 23 26 30 31 32 35 36 60 61 62 63 66 70 71 72 75 76
   node 2 size: 96763 MB
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 2 free: 92744 MB
   node 3 cpus: 24 25 27 28 29 33 34 37 38 39 64 65 67 68 69 73 74 77 78 79
   node 3 size: 96762 MB
   node 3 free: 91793 MB
   node distances:
   node   0   1   2   3
     0:  10  11  21  21
     1:  11  10  21  21
     2:  21  21  10  11
     3:  21  21  11  10

From /proc/meminfo
   MemTotal:        394594852 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="8.2 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.2"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
   system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

uname -a:
   Linux localhost.localdomain 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 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):                      Not affected
CVE-2018-3639 (Speculative Store Bypass):      Mitigation: Speculative Store
```

(Continued on next page)

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Platform Notes (Continued)

```
                                                  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): No status reported
  CVE-2019-11135 (TSX Asynchronous Abort):        Mitigation: Clear CPU buffers; SMT
                                                    vulnerable


  run-level 3 Jun 11 16:15

  SPEC is set to: /home/speccpu
    Filesystem              Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   1.5T   96G  1.4T   7% /home


  From /sys/devices/virtual/dmi/id
      Vendor:         New H3C Technologies Co., Ltd.
      Product:        UniServer R4900 G3
      Product Family: Rack
      Serial:         210235A3TKH193000008


  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:
      12x Hynix HMA84GR7CJR4N-WM 32 GB 2 rank 2933
      12x NO DIMM NO DIMM


  BIOS:
      BIOS Vendor:       American Megatrends Inc.
      BIOS Version:      2.00.48
      BIOS Date:         03/10/2021
      BIOS Revision:     5.14


  (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
```

(Continued on next page)

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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`

(Continued on next page)

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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-V1.4-CLX-RevB.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-V1.4-CLX-RevB.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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