SPEC CPU®2017 Integer Speed Result

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New H3C Technologies Co., Ltd.

$SPECspeed^{®}2017\_int\_base = 10.6$

H3C UniServer R4300 G5 (Intel Xeon Silver 4310)

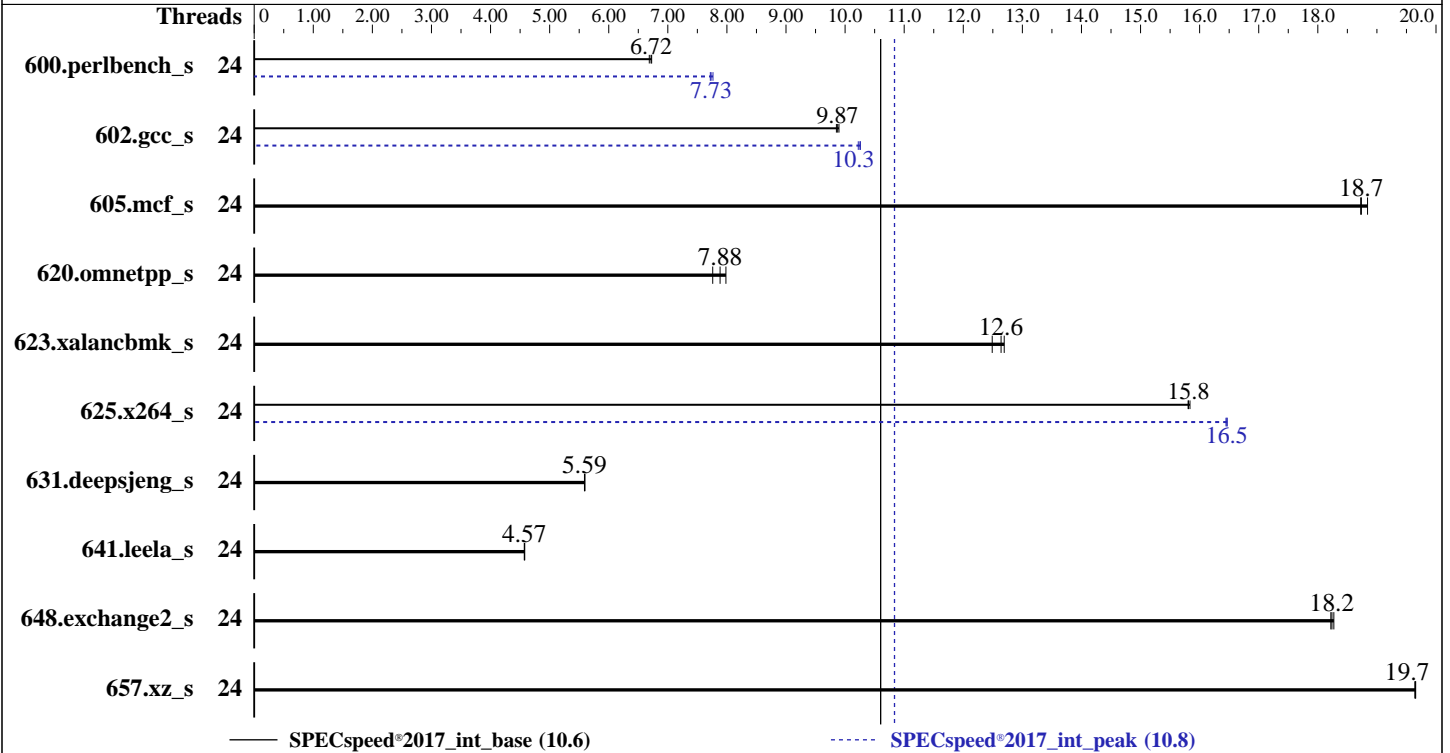$SPECspeed^{®}2017\_int\_peak = 10.8$

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

Test Date: Nov-2021
Hardware Availability: Sep-2020
Software Availability: Jan-2021

Threads graph. Scale 0 to 20.0.

- 600.perlbench_s 24 — base 6.72, peak 7.73
- 602.gcc_s 24 — base 9.87, peak 10.3
- 605.mcf_s 24 — base 18.7
- 620.omnetpp_s 24 — base 7.88
- 623.xalancbmk_s 24 — base 12.6
- 625.x264_s 24 — base 15.8, peak 16.5
- 631.deepsjeng_s 24 — base 5.59
- 641.leela_s 24 — base 4.57
- 648.exchange2_s 24 — base 18.2
- 657.xz_s 24 — base 19.7

SPECspeed®2017_int_base (10.6)   SPECspeed®2017_int_peak (10.8)

Hardware

CPU Name: Intel Xeon Silver 4310
 Max MHz: 3300
 Nominal: 2100
Enabled: 24 cores, 2 chips
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: 18 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200V-R, running at 2667)
Storage: 1 x 480GB SATA SSD
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: Yes
Firmware: Version 5.34 released Sep-2021 BIOS
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 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 | | | | | | |
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	24	264	6.73	**264**	**6.72**	265	6.69	24	**230**	**7.73**	230	7.72	229	7.76
602.gcc_s	24	402	9.90	**403**	**9.87**	404	9.85	24	388	10.3	390	10.2	**388**	**10.3**
605.mcf_s	24	**252**	**18.7**	251	18.8	252	18.7	24	**252**	**18.7**	251	18.8	252	18.7
620.omnetpp_s	24	210	7.76	**207**	**7.88**	204	7.98	24	210	7.76	**207**	**7.88**	204	7.98
623.xalancbmk_s	24	113	12.5	**112**	**12.6**	112	12.7	24	113	12.5	**112**	**12.6**	112	12.7
625.x264_s	24	112	15.8	**112**	**15.8**	111	15.8	24	107	16.4	**107**	**16.5**	107	16.5
631.deepsjeng_s	24	256	5.60	**256**	**5.59**	256	5.59	24	256	5.60	**256**	**5.59**	256	5.59
641.leela_s	24	**373**	**4.57**	373	4.58	373	4.57	24	**373**	**4.57**	373	4.58	373	4.57
648.exchange2_s	24	**161**	**18.2**	161	18.2	161	18.3	24	**161**	**18.2**	161	18.2	161	18.3
657.xz_s	24	315	19.7	315	19.6	**315**	**19.7**	24	315	19.7	315	19.6	**315**	**19.7**
SPECspeed®2017_int_base =		**10.6**												
SPECspeed®2017_int_peak =		**10.8**												

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

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/speccpu/lib/intel64:/home/speccpu/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

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
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
```

(Continued on next page)

New H3C Technologies Co., Ltd.

H3C UniServer R4300 G5 (Intel Xeon Silver 4310)

$SPECspeed^{®}2017\_int\_base = 10.6$

$SPECspeed^{®}2017\_int\_peak = 10.8$

CPU2017 License:	9066	**Test Date:**	Nov-2021
Test Sponsor:	New H3C Technologies Co., Ltd.	**Hardware Availability:**	Sep-2020
Tested by:	New H3C Technologies Co., Ltd.	**Software Availability:**	Jan-2021

General Notes (Continued)

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

Platform Notes

```
BIOS Settings:
 Set Hyper-Threading to Disabled
 Set Power Performance Tuning to BIOS Controls EPB
 Set Energy Performance BIAS to Performance
 Set Patrol Scrub to Disabled

 Sysinfo program /home/speccpu/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost.localdomain Mon Nov 15 10:11:37 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) Silver 4310 CPU @ 2.10GHz
       2  "physical id"s (chips)
       24 "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
       siblings  : 12
       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 from util-linux 2.32.1:
       Architecture:        x86_64
       CPU op-mode(s):      32-bit, 64-bit
       Byte Order:          Little Endian
       CPU(s):              24
       On-line CPU(s) list: 0-23
       Thread(s) per core:  1
       Core(s) per socket:  12
       Socket(s):           2
       NUMA node(s):        2
       Vendor ID:           GenuineIntel
       CPU family:          6
       Model:               106
       Model name:          Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
       Stepping:            6
       CPU MHz:             2284.786
       CPU max MHz:         3300.0000
```

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New H3C Technologies Co., Ltd.

SPECspeed®2017_int_base = 10.6

H3C UniServer R4300 G5 (Intel Xeon Silver 4310)

SPECspeed®2017_int_peak = 10.8

CPU2017 License: 9066

Test Sponsor: New H3C Technologies Co., Ltd.

Tested by: New H3C Technologies Co., Ltd.

Test Date: Nov-2021

Hardware Availability: Sep-2020

Software Availability: Jan-2021

Platform Notes (Continued)

```
          CPU min MHz:             800.0000
          BogoMIPS:                4200.00
          Virtualization:          VT-x
          L1d cache:               48K
          L1i cache:               32K
          L2 cache:                1280K
          L3 cache:                18432K
          NUMA node0 CPU(s):       0-11
          NUMA node1 CPU(s):       12-23
          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 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 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 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 wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp
       hwp_pkg_req 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 : 18432 KB

  From numactl --hardware
  WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 2 nodes (0-1)
    node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11
    node 0 size: 515427 MB
    node 0 free: 514766 MB
    node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
    node 1 size: 516062 MB
    node 1 free: 515349 MB
    node distances:
    node   0   1
      0:  10  20
      1:  20  10

  From /proc/meminfo
     MemTotal:       1056245788 kB
     HugePages_Total:        0
     Hugepagesize:        2048 kB

  /sbin/tuned-adm active
```

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New H3C Technologies Co., Ltd.

$SPECspeed®2017\_int\_base = 10.6$

H3C UniServer R4300 G5 (Intel Xeon Silver 4310)

$SPECspeed®2017\_int\_peak = 10.8$

CPU2017 License: 9066		**Test Date:**	Nov-2021
Test Sponsor: New H3C Technologies Co., Ltd.		**Hardware Availability:** Sep-2020
Tested by: New H3C Technologies Co., Ltd.		**Software Availability:** Jan-2021

Platform Notes (Continued)

```
    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):                  Not affected
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/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):         Not affected


SPEC is set to: /home/speccpu
   Filesystem            Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   392G   31G  361G   8% /home

From /sys/devices/virtual/dmi/id
     Product Family: Rack
```

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Platform Notes (Continued)

```
 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 Hynix HMAA8GR7AJR4N-XN 64 GB 2 rank 3200, configured at 2666
     16x NO DIMM NO DIMM

 BIOS:
    BIOS Vendor:        American Megatrends International, LLC.
    BIOS Version:       5.34
    BIOS Date:          09/11/2021
    BIOS Revision:      5.22

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 600.perlbench_s(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        | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
         | 625.x264_s(base, peak) 657.xz_s(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        | 600.perlbench_s(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        | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
```

(Continued on next page)

New H3C Technologies Co., Ltd.

H3C UniServer R4300 G5 (Intel Xeon Silver 4310)

Compiler Version Notes (Continued)

```
        | 625.x264_s(base, peak) 657.xz_s(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++      | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
         | 631.deepsjeng_s(base, peak) 641.leela_s(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 | 648.exchange2_s(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`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifort`

Base Portability Flags

600.perlbench_s: `-DSPEC_LP64 -DSPEC_LINUX_X64`
602.gcc_s: `-DSPEC_LP64`
605.mcf_s: `-DSPEC_LP64`
620.omnetpp_s: `-DSPEC_LP64`
623.xalancbmk_s: `-DSPEC_LP64 -DSPEC_LINUX`
625.x264_s: `-DSPEC_LP64`

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Base Portability Flags (Continued)

631.deepsjeng_s: `-DSPEC_LP64`
641.leela_s: `-DSPEC_LP64`
648.exchange2_s: `-DSPEC_LP64`
657.xz_s: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX512
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

C++ benchmarks:
```
-DSPEC_OPENMP -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:
```
-m64 -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries
```

Peak Compiler Invocation

C benchmarks (except as noted below):
```
icx
```

600.perlbench_s: `icc`

C++ benchmarks:
```
icpx
```

Fortran benchmarks:
```
ifort
```

Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

```
600.perlbench_s: -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/jemalloc64-5.0.1/lib -ljemalloc
```

```
602.gcc_s: -m64 -std=c11 -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/jemalloc64-5.0.1/lib -ljemalloc
```

```
605.mcf_s: basepeak = yes
```

```
625.x264_s: -DSPEC_OPENMP -fiopenmp -std=c11 -m64 -Wl,-z,muldefs
-xCORE-AVX512 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

```
657.xz_s: basepeak = yes
```

C++ benchmarks:

```
620.omnetpp_s: basepeak = yes
```

```
623.xalancbmk_s: basepeak = yes
```

```
631.deepsjeng_s: basepeak = yes
```

```
641.leela_s: basepeak = yes
```

Fortran benchmarks:

```
648.exchange2_s: basepeak = yes
```

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CPU2017 License: 9066　　　　　　　　　　　　　　　　　**Test Date:**　　　　　　　Nov-2021
Test Sponsor:　　New H3C Technologies Co., Ltd.　　　　**Hardware Availability:** Sep-2020
Tested by:　　　　New H3C Technologies Co., Ltd.　　　　**Software Availability:**　Jan-2021

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-RevD.html`

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-RevD.xml`

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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