## SPEC CPU®2017 Integer Rate Result

**New H3C Technologies Co., Ltd.**

H3C UniServer R4900 G5 (Intel Xeon Gold 6346)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>280</td>
<td>289</td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<tbody>
<tr>
<td>perlbench_r</td>
<td>64</td>
<td>233</td>
<td>289</td>
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<tr>
<td>gcc_r</td>
<td>64</td>
<td>236</td>
<td>280</td>
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<tr>
<td>mcf_r</td>
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<td>omnetpp_r</td>
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<td>xalancbmk_r</td>
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<tr>
<td>deepsjeng_r</td>
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<td>exchange2_r</td>
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<tr>
<td>xz_r</td>
<td>64</td>
<td>150</td>
<td>150</td>
</tr>
</tbody>
</table>

### 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)  
- **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
Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>461</td>
<td>150</td>
<td>461</td>
<td>150</td>
<td>463</td>
</tr>
</tbody>
</table>

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.
SPEC CPU®2017 Integer Rate Result

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 Sponsor: New H3C Technologies Co., Ltd.
Tested by: New H3C Technologies Co., Ltd.
Test Date: Jun-2021
Hardware Availability: Apr-2021
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

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

(Continued on next page)
New H3C Technologies Co., Ltd.

H3C UniServer R4900 G5 (Intel Xeon Gold 6346)

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Copyright 2017-2021 Standard Performance Evaluation Corporation

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Hardware Availability: Apr-2021
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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 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 ms铠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 abmltm abmltm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single intel_ppin ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vmx flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512sfma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsave xsetbv1 xsaoves cqm_llc cqm_occupt_11c cqm_mbb_total cqm_mb8local split_lock_detect wbenoiwd dtherm ida arat pln pts avx512vbm1 umip pku ospke avx512_vbmi2 gfin vaes vpcmulldq avx512_vni avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

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 24 48 49 50 51 52 53 54 55

(Continued on next page)
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SPECrate\textsuperscript{®}2017\textsubscript{int}_\text{base} = 280  
SPECrate\textsuperscript{®}2017\textsubscript{int}_\text{peak} = 289

### 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:  

<table>
<thead>
<tr>
<th>Node</th>
<th>Node 0</th>
<th>Node 1</th>
<th>Node 2</th>
<th>Node 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
<td>11</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>10</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>20</td>
<td>20</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>

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*  

```
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

(Continued on next page)
### Compiler Version Notes (Continued)

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Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113
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<th>500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base)</th>
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Compiler Version Notes (Continued)

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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)
255.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
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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
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Base Compiler Invocation

C benchmarks:
icc

(Continued on next page)
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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
-flt.o -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 -flt.o
-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
### 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` `-DSPEC_LINUX`
- 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)
New H3C Technologies Co., Ltd.
H3C UniServer R4900 G5 (Intel Xeon Gold 6346)

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

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Tested by: New H3C Technologies Co., Ltd.
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Hardware Availability: Apr-2021
Software Availability: Dec-2020

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

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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