New H3C Technologies Co., Ltd.  
H3C UniServer R4900 G3 (Intel Xeon Gold 6226R)  

**SPEC CPU®2017 Integer Rate Result**  
Copyright 2017-2021 Standard Performance Evaluation Corporation  

**Test Sponsor:** New H3C Technologies Co., Ltd.  
**Test Date:** Jun-2021  
**Hardware Availability:** Mar-2020  

**CPU2017 License:** 9066  
**Tested by:** New H3C Technologies Co., Ltd.  
**Software Availability:** Dec-2020  

**SPECrate®2017_int_base = 230**  
**SPECrate®2017_int_peak = 238**  

### Hardware

- **CPU Name:** Intel Xeon Gold 6226R  
- **Max MHz:** 3900  
- **Nominal:** 2900  
- **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:** 22 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
Results Table

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SPECrater®2017_int_base = 230
SPECrater®2017_int_peak = 238

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)
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>

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 982a61ec0915b55891ef0e16aca64d
running on localhost.localdomain Sun Jun 20 01:21:08 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 6226R CPU @ 2.90GHz
  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)
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**Hardware Availability:** Mar-2020  
**Software Availability:** Dec-2020

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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 6226R CPU @ 2.90GHz
- **Stepping:** 7
- **CPU MHz:** 3600.032
- **CPU max MHz:** 3900.0000
- **CPU min MHz:** 1200.0000
- **BogoMIPS:** 5800.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 22528K
- **NUMA node0 CPU(s):** 0-3,8-11,32-35,40-43
- **NUMA node1 CPU(s):** 4-7,12-15,36-39,44-47
- **NUMA node2 CPU(s):** 16-19,24-27,48-51,56-59
- **NUMA node3 CPU(s):** 20-23,28-31,52-55,60-63
- **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 cdp_l3 invpcid_single intel_pinn ssbd mba ibrs ibpis enhanced trp_shadow vmx flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdrt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512vdavx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaveas cqm_llc cqm_occupp_llc cqm_mbb_total cqm_mbb_local dtcsm emt2 den tpr ftrtu pdpte_latitude aperftm rdimate slm intel_pt va_mmu_channel qpuncause refill pdm pdm_tsr

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 8 9 10 11 32 33 34 35 40 41 42 43
  node 0 size: 95057 MB
  node 0 free: 94677 MB
  node 1 cpus: 4 5 6 7 12 13 14 15 36 37 38 39 44 45 46 47
  node 1 size: 96764 MB
  node 1 free: 96378 MB
  node 2 cpus: 16 17 18 19 24 25 26 27 48 49 50 51 56 57 58 59
  node 2 size: 96764 MB

(Continued on next page)```
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### Platform Notes (Continued)

- **node 2 free:** 96468 MB  
- **node 3 cpus:** 20 21 22 23 28 29 30 31 52 53 54 55 60 61 62 63  
- **node 3 size:** 96763 MB  
- **node 3 free:** 95800 MB  
- **node distances:**
  - node 0: 10 21 21 21  
  - node 1: 11 10 21 21  
  - node 2: 21 21 10 11  
  - node 3: 21 21 11 10

From /proc/meminfo

- **MemTotal:** 394598312 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)"

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
- Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
- Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
- Mitigation: Clear CPU buffers; SMT vulnerable

run-level 3 Jun 20 01:15

SPEC is set to: /home/speccpu
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 1.5T 97G 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)
New H3C Technologies Co., Ltd.
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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 | 502.gcc_r(peak)

__________________________________________________________
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)

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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  
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| C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
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| C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)  
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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:**

icx

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

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**Base Compiler Invocation (Continued)**

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

**Base Portability Flags**

```plaintext
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)
New H3C Technologies Co., Ltd. | SPECrate®2017_int_base = 230
H3C UniServer R4900 G3 (Intel Xeon Gold 6226R) | SPECrate®2017_int_peak = 238

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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

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/New_H3C-Platform-Settings-V1.4-CLX-RevB.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-V1.4-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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