



# SPEC CPU®2017 Integer Rate Result

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## New H3C Technologies Co., Ltd.

H3C UniServer R4900 G6 Ultra (Intel Xeon Silver 4510)

SPECrate®2017\_int\_base = 248

SPECrate®2017\_int\_peak = Not Run

CPU2017 License: 9066

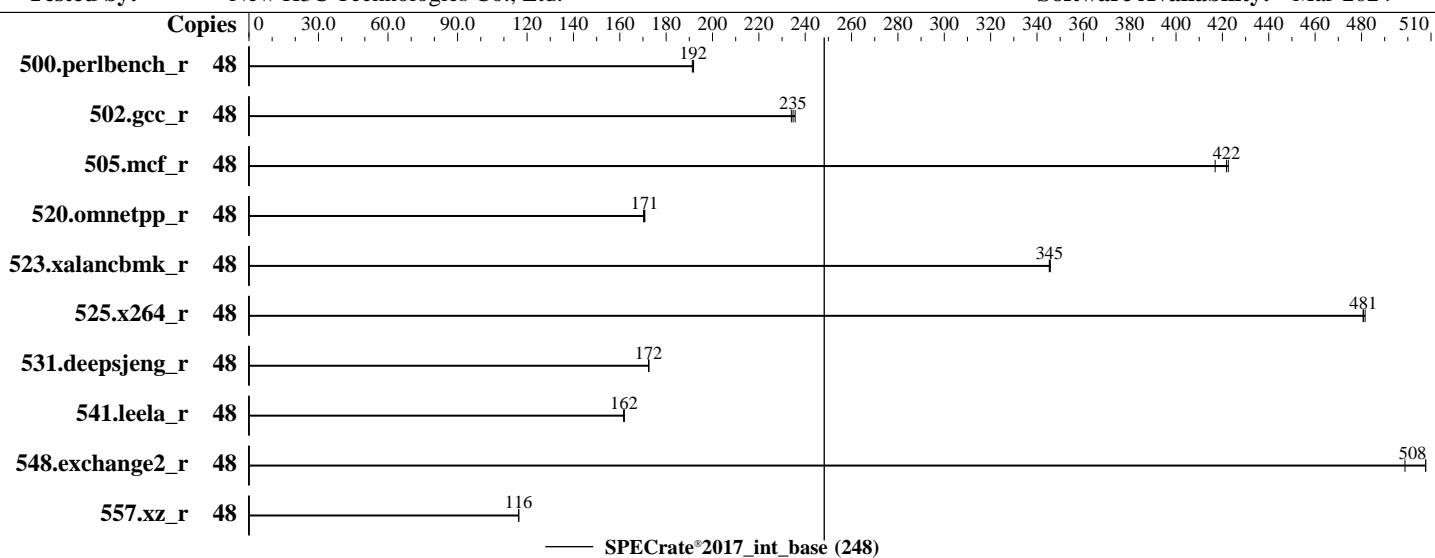
Test Sponsor: New H3C Technologies Co., Ltd.

Tested by: New H3C Technologies Co., Ltd.

Test Date: Jul-2024

Hardware Availability: Oct-2023

Software Availability: Mar-2024



### Hardware

CPU Name: Intel Xeon Silver 4510  
 Max MHz: 4100  
 Nominal: 2400  
 Enabled: 24 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 2 MB I+D on chip per core  
 L3: 30 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-6400B-R, running at 4400)  
 Storage: 1 x 6.4 TB NVME SSD  
 Other: CPU Cooling: Air

### Software

OS: SUSE Linux Enterprise High Performance Computing 15 SP5  
 Compiler: 5.14.21-150500.53-default  
 C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux;  
 Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;  
 Parallel: No  
 Firmware: Version 6.10.38P60 released Apr-2024 BIOS  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: None  
 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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	48	398	192	400	191	<b>399</b>	<b>192</b>							
502.gcc_r	48	<b>290</b>	<b>235</b>	290	234	288	236							
505.mcf_r	48	184	423	186	417	<b>184</b>	<b>422</b>							
520.omnetpp_r	48	370	170	369	171	<b>369</b>	<b>171</b>							
523.xalancbmk_r	48	<b>147</b>	<b>345</b>	147	345	147	346							
525.x264_r	48	175	482	175	481	<b>175</b>	<b>481</b>							
531.deepsjeng_r	48	319	173	<b>319</b>	<b>172</b>	319	172							
541.leela_r	48	<b>491</b>	<b>162</b>	491	162	492	162							
548.exchange2_r	48	252	499	248	508	<b>248</b>	<b>508</b>							
557.xz_r	48	446	116	445	116	<b>446</b>	<b>116</b>							

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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/speccpunew/lib/intel64:/home/speccpunew/lib/ia32:/home/speccpunew/je5.0.1-32"  
MALLOC\_CONF = "retain:true"

## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM  
memory using Red Hat Enterprise Linux 8.4

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>

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.



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## Platform Notes

### BIOS Settings:

SNC = Enable SNC2 (2-clusters)  
Power Performance Tuning = BIOS Controls EPB  
ENERGY\_PERF\_BIAS\_CFG mode = Performance

```
Sysinfo program /home/speccpunew/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Wed Jul 31 10:21:31 2024
```

SUT (System Under Test) info as seen by some common utilities.

### Table of contents

- 1. uname -a
- 2. w
- 3. Username
- 4. ulimit -a
- 5. sysinfo process ancestry
- 6. /proc/cpuinfo
- 7. lscpu
- 8. numactl --hardware
- 9. /proc/meminfo
- 10. who -r
- 11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
- 12. Services, from systemctl list-unit-files
- 13. Linux kernel boot-time arguments, from /proc/cmdline
- 14. cpupower frequency-info
- 15. tuned-adm active
- 16. sysctl
- 17. /sys/kernel/mm/transparent\_hugepage
- 18. /sys/kernel/mm/transparent\_hugepage/khugepaged
- 19. OS release
- 20. Disk information
- 21. /sys/devices/virtual/dmi/id
- 22. dmidecode
- 23. BIOS

```
1. uname -a
Linux localhost 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043/1p)
x86_64 x86_64 x86_64 GNU/Linux
```

```
2. w
10:21:31 up 17:15, 3 users, load average: 0.11, 12.69, 30.41
USER   TTY      FROM             LOGIN@    IDLE    JCPU    PCPU WHAT
root    pts/1    -               Tue17    16.00s  1.05s  0.01s sh intrate.sh
root    pts/0    172.16.27.225  Tue17    8:59   0.07s  0.07s -bash
root    pts/1    172.16.27.225  Tue17    59.00s  0.29s  0.29s -bash
```

```
3. Username
From environment variable $USER: root
```

```
4. ulimit -a
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
```

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## Platform Notes (Continued)

```
scheduling priority          (-e) 0
file size                  (blocks, -f) unlimited
pending signals             (-i) 4124814
max locked memory          (kbytes, -l) 64
max memory size            (kbytes, -m) unlimited
open files                 (-n) 1024
pipe size                  (512 bytes, -p) 8
POSIX message queues       (bytes, -q) 819200
real-time priority          (-r) 0
stack size                 (kbytes, -s) unlimited
cpu time                   (seconds, -t) unlimited
max user processes          (-u) 4124814
virtual memory              (kbytes, -v) unlimited
file locks                 (-x) unlimited
```

---

### 5. sysinfo process ancestry

```
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
sh intrate.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 -c
  ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=24 --define physicalfirst
  --define invoke_with_interleave --define drop_caches --tune base -o all intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --configfile
  ic2024.1-lin-sapphirerapids-rate-20240308.cfg --define smt-on --define cores=24 --define physicalfirst
  --define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
  rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
  $SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/speccpunew
```

---

### 6. /proc/cpuinfo

```
model name      : INTEL(R) XEON(R) SILVER 4510
vendor_id       : GenuineIntel
cpu family     : 6
model          : 143
stepping        : 8
microcode       : 0xb0000571
bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrss_pbrss
cpu cores       : 12
siblings         : 24
2 physical ids (chips)
48 processors (hardware threads)
physical id 0: core ids 0-11
physical id 1: core ids 0-11
physical id 0: apicids 0-23
physical id 1: apicids 64-87
```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

---

### 7. lscpu

From lscpu from util-linux 2.37.4:

```
Architecture:           x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         52 bits physical, 57 bits virtual
Byte Order:            Little Endian
```

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## Platform Notes (Continued)

```

CPU(s): 48
On-line CPU(s) list: 0-47
Vendor ID: GenuineIntel
Model name: INTEL(R) XEON(R) SILVER 4510
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 12
Socket(s): 2
Stepping: 8
CPU max MHz: 4100.0000
CPU min MHz: 800.0000
BogoMIPS: 4800.00
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 xtTopology
       nonstop_tsc cpuid aperfmpf tsc_known_freq pni pclmulqdq dtes64 monitor
       ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xptr 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 cat_l2 cdp_l3
       invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
       tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmil hle
       avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap
       avx512fma 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida
       arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbm1 umip pku
       ospke waitpkg avx512_vbm1 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
       tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
       enqcmd fsrm md_clear serialize tsxlptrk pconfig arch_lbr avx512_fp16
       amx_tile flush_l1d arch_capabilities

Virtualization: VT-x
L1d cache: 1.1 MiB (24 instances)
L1i cache: 768 KiB (24 instances)
L2 cache: 48 MiB (24 instances)
L3 cache: 60 MiB (2 instances)
NUMA node(s): 4
NUMA node0 CPU(s): 0-5,24-29
NUMA node1 CPU(s): 6-11,30-35
NUMA node2 CPU(s): 12-17,36-41
NUMA node3 CPU(s): 18-23,42-47
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW
sequence
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	1.1M	12	Data	1	64	1	64
L1i	32K	768K	8	Instruction	1	64	1	64
L2	2M	48M	16	Unified	2	2048	1	64
L3	30M	60M	15	Unified	3	32768	1	64

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## Platform Notes (Continued)

```
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0-5,24-29
node 0 size: 257549 MB
node 0 free: 251283 MB
node 1 cpus: 6-11,30-35
node 1 size: 258044 MB
node 1 free: 253264 MB
node 2 cpus: 12-17,36-41
node 2 size: 258010 MB
node 2 free: 253492 MB
node 3 cpus: 18-23,42-47
node 3 size: 257629 MB
node 3 free: 252500 MB
node distances:
node   0   1   2   3
 0: 10  12  21  21
 1: 12  10  21  21
 2: 21  21  10  12
 3: 21  21  12  10
```

```
9. /proc/meminfo
MemTotal:      1055984232 kB
```

```
10. who -r
run-level 3 Jul 30 17:06
```

```
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
Default Target  Status
multi-user      running
```

```
12. Services, from systemctl list-unit-files
STATE          UNIT FILES
enabled        YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron display-manager firewalld getty@
                irqbalance issue-generator kbdsettings kdump kdump-early klog lvm2-monitor nsqd
                nvmeffc-boot-connections postfix purge-kernels rollback rsyslog smartd sshd systemd-pstore
                wickedd wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
                systemd-remount-fs
disabled       autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                chronyd console-getty cups cups-browsed debug-shell dmraid-activation ebtables
                exchange-bmc-os-info gpm grub2-once haveged haveged-switch-root ipmi ipmievfd irqbindall
                issue-add-ssh-keys kexec-load ksm kvm_kvm_stat lunmask man-db-create multipathd nfs nfs-blkmap
                nvmf-autoconnect rpcbind rpmconfigcheck rsyncd serial-getty@ set_kthread_prio
                smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd tuned
                udisks2 vncserver@
indirect        wickedd
```

```
13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
root=UUID=4607dbe1-932d-4bea-b43c-6701598385ba
splash=silent
```

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## Platform Notes (Continued)

```
resume=/dev/disk/by-uuid/2ccfd1c4-5b7d-4cdb-9370-ac95a4f79b6
mitigations=auto
quiet
security=apparmor
crashkernel=403M,high
crashkernel=72M,low
```

```
-----  
14. cpupower frequency-info  
analyzing CPU 0:  
    current policy: frequency should be within 800 MHz and 4.10 GHz.  
        The governor "performance" may decide which speed to use  
        within this range.  
    boost state support:  
        Supported: yes  
        Active: yes
```

```
-----  
15. tuned-adm active  
Current active profile: throughput-performance
```

```
-----  
16. sysctl  
kernel.numa_balancing          0  
kernel.randomize_va_space       2  
vm.compaction_proactiveness   20  
vm.dirty_background_bytes      0  
vm.dirty_background_ratio     10  
vm.dirty_bytes                 0  
vm.dirty_expire_centisecs     3000  
vm.dirty_ratio                 20  
vm.dirty_writeback_centisecs  500  
vm.dirtytime_expire_seconds   43200  
vm.extfrag_threshold          500  
vm.min_unmapped_ratio         1  
vm.nr_hugepages                0  
vm.nr_hugepages_mempolicy      0  
vm.nr_overcommit_hugepages    0  
vm.swappiness                  10  
vm.watermark_boost_factor     15000  
vm.watermark_scale_factor      10  
vm.zone_reclaim_mode          0
```

```
-----  
17. /sys/kernel/mm/transparent_hugepage  
defrag           always defer defer+madvise [madvise] never  
enabled          [always] madvise never  
hpage_pmd_size  2097152  
shmem_enabled   always within_size advise [never] deny force
```

```
-----  
18. /sys/kernel/mm/transparent_hugepage/khugepaged  
alloc_sleep_millisecs  60000  
defrag               1  
max_ptes_none        511  
max_ptes_shared      256  
max_ptes_swap        64  
pages_to_scan        4096  
scan_sleep_millisecs 10000
```

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## Platform Notes (Continued)

19. OS release

```
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise High Performance Computing 15 SP5
```

20. Disk information

```
SPEC is set to: /home/speccpunew
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/nvme0n1p3  xfs   1.0T  318G  707G  31%  /home
```

21. /sys/devices/virtual/dmi/id

```
Vendor:          N/A
Product:         N/A
Product Family: Rack
Serial:          N/A
```

22. dmidecode

Additional information from dmidecode 3.4 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 HMCG94AHBRA487N 64 GB 2 rank 6400, configured at 4400
```

23. BIOS

(This section combines info from /sys/devices and dmidecode.)

```
BIOS Vendor:      American Megatrends International, LLC.
BIOS Version:    6.10.38P60
BIOS Date:       04/03/2024
BIOS Revision:   5.32
```

## Compiler Version Notes

```
=====
C      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
-----
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
-----

=====
C++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
-----
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
-----

=====
Fortran | 548.exchange2_r(base)
-----
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
```



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## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

## 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 -xsapphirerapids -O3 -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-L/opt/intel/oneapi/compiler/2024.1/lib -lgkmalloc

C++ benchmarks:

-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-L/opt/intel/oneapi/compiler/2024.1/lib -lgkmalloc

Fortran benchmarks:

-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-nostandard-realloc-lhs -align array32byte -auto  
-L/opt/intel/oneapi/compiler/2024.1/lib -lgkmalloc



# SPEC CPU®2017 Integer Rate Result

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## New H3C Technologies Co., Ltd.

H3C UniServer R4900 G6 Ultra (Intel Xeon Silver 4510)

SPECrate®2017\_int\_base = 248

SPECrate®2017\_int\_peak = Not Run

CPU2017 License: 9066

Test Date: Jul-2024

Test Sponsor: New H3C Technologies Co., Ltd.

Hardware Availability: Oct-2023

Tested by: New H3C Technologies Co., Ltd.

Software Availability: Mar-2024

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html>

[http://www.spec.org/cpu2017/flags/New\\_H3C-Platform-Settings-V1.0-SPR-RevE.html](http://www.spec.org/cpu2017/flags/New_H3C-Platform-Settings-V1.0-SPR-RevE.html)

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml>

[http://www.spec.org/cpu2017/flags/New\\_H3C-Platform-Settings-V1.0-SPR-RevE.xml](http://www.spec.org/cpu2017/flags/New_H3C-Platform-Settings-V1.0-SPR-RevE.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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