



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

New H3C Technologies Co., Ltd.

H3C UniServer R4700 G6 (Intel Xeon Silver 4510)

SPECrate®2017_int_base = 246

SPECrate®2017_int_peak = Not Run

CPU2017 License: 9066

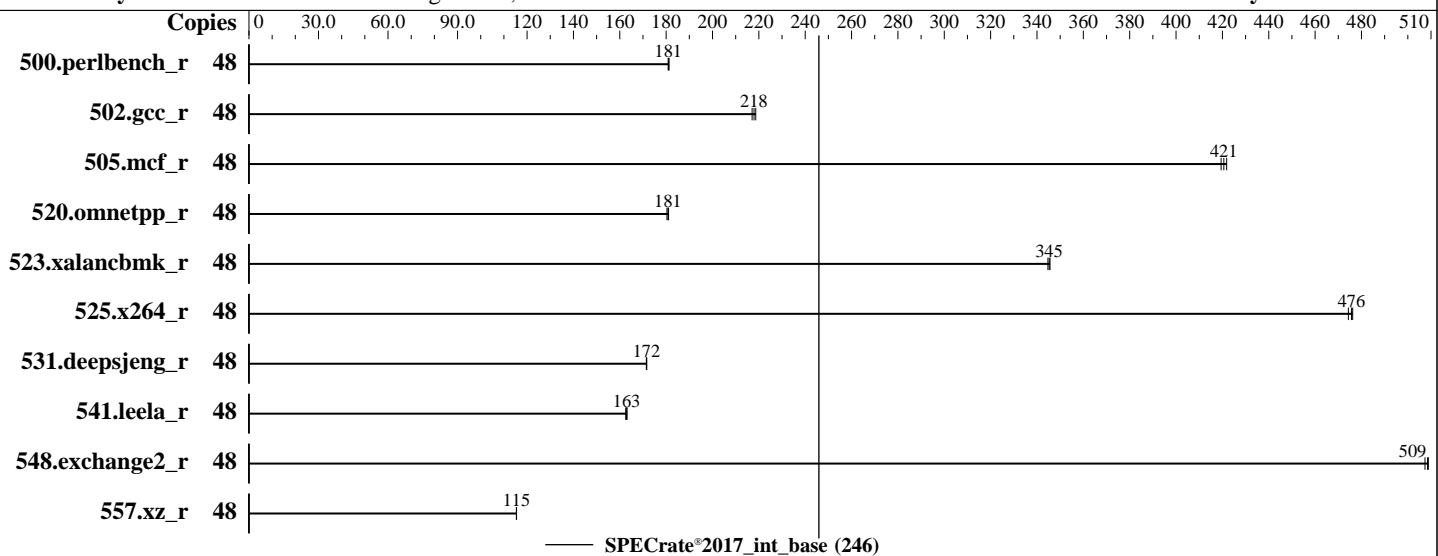
Test Sponsor: New H3C Technologies Co., Ltd.

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 | Seconds | Ratio |
| 500.perlbench_r | 48 | 422 | 181 | 422 | 181 | 422 | 181 | | | | | | | | | |
| 502.gcc_r | 48 | 311 | 219 | 312 | 218 | 313 | 217 | | | | | | | | | |
| 505.mcf_r | 48 | 185 | 419 | 184 | 421 | 184 | 422 | | | | | | | | | |
| 520.omnetpp_r | 48 | 348 | 181 | 348 | 181 | 349 | 180 | | | | | | | | | |
| 523.xalancbmk_r | 48 | 147 | 345 | 147 | 345 | 147 | 346 | | | | | | | | | |
| 525.x264_r | 48 | 177 | 476 | 177 | 474 | 176 | 476 | | | | | | | | | |
| 531.deepsjeng_r | 48 | 321 | 172 | 321 | 172 | 321 | 171 | | | | | | | | | |
| 541.leela_r | 48 | 489 | 163 | 488 | 163 | 487 | 163 | | | | | | | | | |
| 548.exchange2_r | 48 | 247 | 509 | 247 | 509 | 248 | 507 | | | | | | | | | |
| 557.xz_r | 48 | 449 | 115 | 449 | 115 | 449 | 115 | | | | | | | | | |

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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 Tue Jul 23 01:42:16 2024
```

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

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- 1. uname -a
- 2. w
- 3. Username
- 4. ulimit -a
- 5. sysinfo process ancestry
- 6. /proc/cpuinfo
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- 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
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- 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
01:42:16 up 3:44, 1 user, load average: 0.00, 0.39, 10.11
USER   TTY      FROM          LOGIN@    IDLE    JCPU   PCPU WHAT
root   ttyl     -           21:59    18.00s  1.09s  0.01s sh intrate.sh
```

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

```
4. ulimit -a
core file size          (blocks, -c) unlimited
data seg size            (kbytes, -d) unlimited
scheduling priority      (-e) 0
file size                (blocks, -f) unlimited
```

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Platform Notes (Continued)

| | |
|----------------------|-------------------------|
| 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/CPU2017.021/templogs/preenv.intrate.021.0.log --lognum 021.0 --from_runcpu 2
specperl \$SPEC/bin/sysinfo
\$SPEC = /home/speccpu

6. /proc/cpuinfo
model name : INTEL(R) XEON(R) SILVER 4510
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2b000571
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrp_pbrsb
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
CPU(s): 48
On-line CPU(s) list: 0-47

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Platform Notes (Continued)

| | |
|----------------------------------|--|
| 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 xtopology nonstop_tsc cpuid aperfmpf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtrp pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrandlahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cat_12 cdp_13 invpcid_single intel_ppin cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnumi flexpriority ept vpid ept_ad 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 split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbmi umip pku ospke waitpkg avx512_vbmi2 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_lll 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 Llftf: | 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/swapgs 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 sync 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: 255230 MB
node 1 cpus: 6-11,30-35
node 1 size: 258044 MB
node 1 free: 256086 MB
node 2 cpus: 12-17,36-41
node 2 size: 258044 MB
node 2 free: 256064 MB
node 3 cpus: 18-23,42-47
node 3 size: 257595 MB
node 3 free: 254477 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 22 21:58
```

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 nvmefc-boot-connections postfix purge-kernels rollback rsyslog smartd sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny |
| enabled-runtime | 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 ebttables exchange-bmc-os-info gpm grub2-once haveged haveged-switch-root ipmi ipmievfd irqbindall issue-add-ssh-keys kexec-load ksm 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
resume=/dev/disk/by-uuid/2ccfd1c4-5b7d-4cdb-9370-aca95a4f79b6
mitigations=auto
```

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Platform Notes (Continued)

```
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  
It seems that tuned daemon is not running, preset profile is not activated.  
Preset 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                  60  
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/nvme1n1p3  xfs   1.0T  331G  693G  33% /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

```
===== | 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.
=====
```

```
===== | 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.
=====
```

```
===== | 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



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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

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

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

Tested with SPEC CPU®2017 v1.1.9 on 2024-07-22 13:42:15-0400.

Report generated on 2024-09-05 11:42:19 by CPU2017 PDF formatter v6716.

Originally published on 2024-08-27.