SPEC CPU®2017 Integer Rate Result

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Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

$SPECrate^{®}2017\_int\_base = 640$

$SPECrate^{®}2017\_int\_peak = 659$
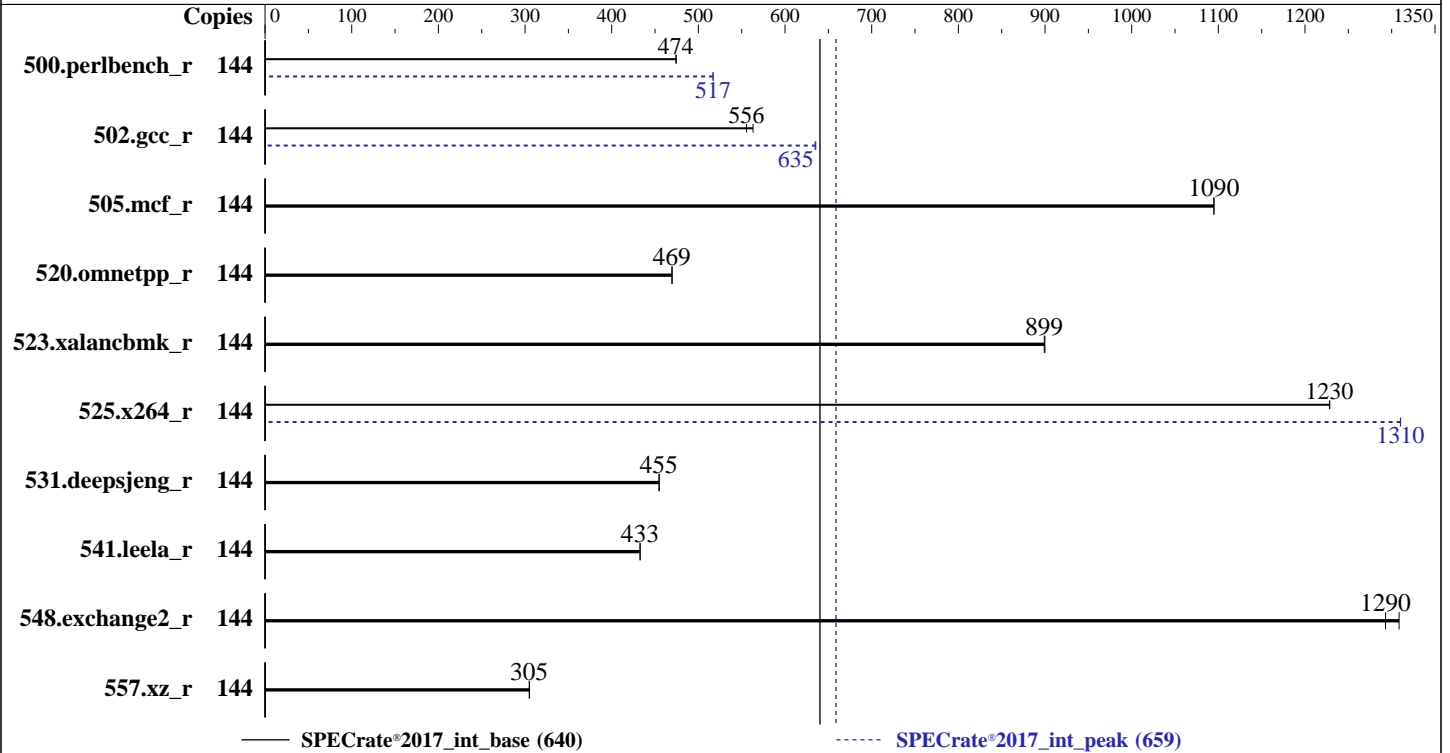
CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Dec-2023
Hardware Availability: May-2023
Software Availability: Dec-2023

Benchmark	Copies	Base	Peak
500.perlbench_r	144	474	517
502.gcc_r	144	556	635
505.mcf_r	144	1090	
520.omnetpp_r	144	469	
523.xalancbmk_r	144	899	
525.x264_r	144	1230	1310
531.deepsjeng_r	144	455	
541.leela_r	144	433	
548.exchange2_r	144	1290	
557.xz_r	144	305	

SPECrate®2017_int_base (640)   SPECrate®2017_int_peak (659)

Hardware

CPU Name: Intel Xeon Gold 6416H
 Max MHz: 4200
 Nominal: 2200
Enabled: 72 cores, 4 chips, 2 threads/core
Orderable: 2,4 chips
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 45 MB I+D on chip per chip
 Other: None
Memory: 2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)
Storage: 90 GB on tmpfs
Other: None

Software

OS: Red Hat Enterprise Linux 9.2 (Plow)
 5.14.0-284.11.1.el9_2.x86_64
Compiler: C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Version 1.6.6 released Sep-2023
File System: tmpfs
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 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	144	483	474	**484**	**474**			144	443	517	**444**	**517**		
502.gcc_r	144	362	563	**367**	**556**			144	321	635	**321**	**635**		
505.mcf_r	144	**213**	**1090**	213	1090			144	**213**	**1090**	213	1090		
520.omnetpp_r	144	402	470	**402**	**469**			144	402	470	**402**	**469**		
523.xalancbmk_r	144	**169**	**899**	169	900			144	**169**	**899**	169	900		
525.x264_r	144	**205**	**1230**	205	1230			144	192	1310	**192**	**1310**		
531.deepsjeng_r	144	**363**	**455**	363	455			144	**363**	**455**	363	455		
541.leela_r	144	**551**	**433**	551	433			144	**551**	**433**	551	433		
548.exchange2_r	144	**292**	**1290**	288	1310			144	**292**	**1290**	288	1310		
557.xz_r	144	**510**	**305**	510	305			144	**510**	**305**	510	305		
SPECrate®2017_int_base =		**640**												
SPECrate®2017_int_peak =		**659**												

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 =
    "/mnt/ramdisk/cpu2017-1.1.9-ic2023.2.3/lib/intel64:/mnt/ramdisk/cpu2017-1.1.9-ic2023.2.3/lib/ia32:/mnt
    /ramdisk/cpu2017-1.1.9-ic2023.2.3/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>
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

(Continued on next page)

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

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General Notes (Continued)

```
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.

Benchmark run from a 90 GB ramdisk created with the cmd: "mount -t tmpfs -o size=90G tmpfs /mnt/ramdisk"
```

Platform Notes

```
BIOS settings:
                ADDDC Setting : Disabled
        DIMM Self Healing on
   Uncorrectable Memory Error : Disabled

      DCU Streamer Prefetcher : Disabled
             Sub NUMA Cluster : 2-way Clustering
                 LLC Prefetch : Disabled
         Dead Line LLC Alloc : Disabled
               Optimizer Mode : Enabled

               System Profile : Custom
        CPU Power Management : Maximum Performance
                          C1E : Disabled
                     C States : Autonomous
          Memory Patrol Scrub : Disabled
      Energy Efficiency Policy : Performance
            PCI ASPM L1 Link
             Power Management : Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Mon Dec 11 11:18:38 2023

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 252 (252-13.el9_2)
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
```

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Platform Notes (Continued)

```
 19. OS release
 20. Disk information
 21. /sys/devices/virtual/dmi/id
 22. dmidecode
 23. BIOS
 ----------------------------------------------------------------

 ----------------------------------------------------------------
 1. uname -a
   Linux localhost.localdomain 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT
   2023 x86_64 x86_64 x86_64 GNU/Linux

 ----------------------------------------------------------------
 2. w
   11:18:39 up 1 min,  1 user,  load average: 1.35, 0.73, 0.28
   USER      TTY          LOGIN@   IDLE   JCPU   PCPU WHAT
   root      tty1        11:17   31.00s  0.97s  0.00s /bin/bash ./dell-run-speccpu.sh rate --define
   DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProc=1 --define DL-BIOS-adddcD=1 --define
   DL-VERS=v4.8.5 --output_format html,pdf,txt --define DL-LQC=1

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

 ----------------------------------------------------------------
 4. ulimit -a
   real-time non-blocking time  (microseconds, -R) unlimited
   core file size              (blocks, -c) 0
   data seg size               (kbytes, -d) unlimited
   scheduling priority                (-e) 0
   file size                   (blocks, -f) unlimited
   pending signals                    (-i) 8252695
   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) 8252695
   virtual memory              (kbytes, -v) unlimited
   file locks                         (-x) unlimited

 ----------------------------------------------------------------
 5. sysinfo process ancestry
 /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
 login -- root
 -bash
 /bin/bash ./DELL_rate.sh
 /bin/bash ./dell-run-main.sh rate
 /bin/bash ./dell-run-main.sh rate
 /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProc=1
   --define DL-BIOS-adddcD=1 --define DL-VERS=v4.8.5 --output_format html,pdf,txt --define DL-LQC=1
 /bin/bash ./dell-run-speccpu.sh rate --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProc=1
   --define DL-BIOS-adddcD=1 --define DL-VERS=v4.8.5 --output_format html,pdf,txt --define DL-LQC=1
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 -c
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=72 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak -o all --define DL-4S=1 --define
   DL-BIOS-SNC=2 --iterations 2 --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProc=1 --define
```

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Platform Notes (Continued)

```
   DL-BIOS-adddcD=1 --define DL-VERS=v4.8.5 --output_format html,pdf,txt --define DL-LQC=1 intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 --configfile
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=72 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --define DL-4S=1
   --define DL-BIOS-SNC=2 --iterations 2 --define DL-BIOSinc=Dell-BIOS_Xeon-4.inc --define DL-BIOS-LogProc=1
   --define DL-BIOS-adddcD=1 --define DL-VERS=v4.8.5 --output_format html,pdf,txt --define DL-LQC=1 --nopower
   --runmode rate --tune base:peak --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 = /mnt/ramdisk/cpu2017-1.1.9-ic2023.2.3

    ------------------------------------------------------------
 6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Gold 6416H
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 7
    microcode       : 0x2b0004d0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
    cpu cores       : 18
    siblings        : 36
    4 physical ids (chips)
    144 processors (hardware threads)
    physical id 0: core ids 0-17
    physical id 1: core ids 0-17
    physical id 2: core ids 0-17
    physical id 3: core ids 0-17
    physical id 0: apicids 0-35
    physical id 1: apicids 128-163
    physical id 2: apicids 256-291
    physical id 3: apicids 384-419
  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:            46 bits physical, 57 bits virtual
  Byte Order:               Little Endian
  CPU(s):                   144
  On-line CPU(s) list:      0-143
  Vendor ID:                GenuineIntel
  BIOS Vendor ID:           Intel
  Model name:               Intel(R) Xeon(R) Gold 6416H
  BIOS Model name:          Intel(R) Xeon(R) Gold 6416H
  CPU family:               6
  Model:                    143
  Thread(s) per core:       2
  Core(s) per socket:       18
  Socket(s):                4
  Stepping:                 7
  CPU max MHz:              4200.0000
  CPU min MHz:              800.0000
  BogoMIPS:                 4400.00
  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
```

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Platform Notes (Continued)

```
                            lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                            nonstop_tsc cpuid aperfmperf tsc_known_freq 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 cat_l2 cdp_l3
                            invpcid_single cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow
                            vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2
                            erms invpcid 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
                            hfi 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 tsxldtrk pconfig
                            arch_lbr ibt amx_bf16 avx512_fp16 amx_tile amx_int8 flush_l1d
                            arch_capabilities
    Virtualization:         VT-x
    L1d cache:              3.4 MiB (72 instances)
    L1i cache:              2.3 MiB (72 instances)
    L2 cache:               144 MiB (72 instances)
    L3 cache:               180 MiB (4 instances)
    NUMA node(s):           8
    NUMA node0 CPU(s):      0,4,12,20,32,44,48,56,64,72,76,84,92,104,116,120,128,136
    NUMA node1 CPU(s):      8,16,24,28,36,40,52,60,68,80,88,96,100,108,112,124,132,140
    NUMA node2 CPU(s):      1,9,13,21,33,45,49,61,65,73,81,85,93,105,117,121,133,137
    NUMA node3 CPU(s):      5,17,25,29,37,41,53,57,69,77,89,97,101,109,113,125,129,141
    NUMA node4 CPU(s):      10,14,18,26,34,42,46,54,66,82,86,90,98,106,114,118,126,138
    NUMA node5 CPU(s):      2,6,22,30,38,50,58,62,70,74,78,94,102,110,122,130,134,142
    NUMA node6 CPU(s):      3,11,15,27,35,39,51,55,67,75,83,87,99,107,111,123,127,139
    NUMA node7 CPU(s):      7,19,23,31,43,47,59,63,71,79,91,95,103,115,119,131,135,143
    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
    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 async abort: Not affected

  From lscpu --cache:
       NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
       L1d      48K     3.4M   12 Data          1    64      1            64
       L1i      32K     2.3M    8 Instruction   1    64      1            64
       L2        2M     144M   16 Unified       2  2048      1            64
       L3       45M     180M   15 Unified       3 49152      1            64

  ------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0,4,12,20,32,44,48,56,64,72,76,84,92,104,116,120,128,136
    node 0 size: 256944 MB
    node 0 free: 256220 MB
    node 1 cpus: 8,16,24,28,36,40,52,60,68,80,88,96,100,108,112,124,132,140
    node 1 size: 258043 MB
    node 1 free: 247034 MB
```

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Platform Notes (Continued)

```
  node 2 cpus: 1,9,13,21,33,45,49,61,65,73,81,85,93,105,117,121,133,137
  node 2 size: 258043 MB
  node 2 free: 257499 MB
  node 3 cpus: 5,17,25,29,37,41,53,57,69,77,89,97,101,109,113,125,129,141
  node 3 size: 258043 MB
  node 3 free: 257423 MB
  node 4 cpus: 10,14,18,26,34,42,46,54,66,82,86,90,98,106,114,118,126,138
  node 4 size: 258043 MB
  node 4 free: 257416 MB
  node 5 cpus: 2,6,22,30,38,50,58,62,70,74,78,94,102,110,122,130,134,142
  node 5 size: 258043 MB
  node 5 free: 257374 MB
  node 6 cpus: 3,11,15,27,35,39,51,55,67,75,83,87,99,107,111,123,127,139
  node 6 size: 258043 MB
  node 6 free: 257490 MB
  node 7 cpus: 7,19,23,31,43,47,59,63,71,79,91,95,103,115,119,131,135,143
  node 7 size: 258029 MB
  node 7 free: 257533 MB
  node distances:
  node   0   1   2   3   4   5   6   7
    0:  10  12  21  21  21  21  21  21
    1:  12  10  21  21  21  21  21  21
    2:  21  21  10  12  21  21  21  21
    3:  21  21  12  10  21  21  21  21
    4:  21  21  21  21  10  12  21  21
    5:  21  21  21  21  12  10  21  21
    6:  21  21  21  21  21  21  10  12
    7:  21  21  21  21  21  21  12  10


  ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       2112755408 kB


  ------------------------------------------------------------
10. who -r
   run-level 3 Dec 11 11:17


  ------------------------------------------------------------
11. Systemd service manager version: systemd 252 (252-13.el9_2)
   Default Target  Status
   multi-user      running


  ------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE             UNIT FILES
   enabled           ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
                     accounts-daemon atd auditd avahi-daemon bluetooth chronyd crond cups dbus-broker firewalld
                     gdm getty@ insights-client-boot irqbalance iscsi iscsi-onboot kdump libstoragemgmt
                     low-memory-monitor lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
                     nvmefc-boot-connections ostree-remount power-profiles-daemon qemu-guest-agent rhsmcertd
                     rsyslog rtkit-daemon selinux-autorelabel-mark smartd sshd sssd switcheroo-control
                     systemd-boot-update systemd-network-generator tuned udisks2 upower vgauthd vmtoolsd
   enabled-runtime   systemd-remount-fs
   disabled          arp-ethers blk-availability brltty canberra-system-bootup canberra-system-shutdown
                     canberra-system-shutdown-reboot chrony-wait cni-dhcp console-getty cpupower cups-browsed
                     dbus-daemon debug-shell dnf-system-upgrade dnsmasq iprdump iprinit iprupdate iscsid
                     iscsiuio kpatch kvm_stat ledmon man-db-restart-cache-update nftables nvmf-autoconnect
                     ostree-readonly-sysroot-migration podman podman-auto-update podman-clean-transient
                     podman-kube@ podman-restart psacct ras-mc-ctl rasdaemon rdisc rhcd rhsm rhsm-facts
                     rpmdb-rebuild selinux-check-proper-disable serial-getty@ speech-dispatcherd sshd-keygen@
```

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Platform Notes (Continued)

```
                  systemd-boot-check-no-failures systemd-pstore systemd-sysext wpa_supplicant
   indirect       spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
                  systemd-sysupdate systemd-sysupdate-reboot

  ----------------------------------------------------------------
  13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
    root=/dev/mapper/rhel-root
    ro
    crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel/swap
    rhgb
    quiet

  ----------------------------------------------------------------
  14. cpupower frequency-info
    analyzing CPU 0:
      current policy: frequency should be within 4.20 GHz and 4.20 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              1
    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                     40
    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

  ----------------------------------------------------------------
```

Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

$SPECrate^{®}2017\_int\_base = 640$

$SPECrate^{®}2017\_int\_peak = 659$

CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Dec-2023
Hardware Availability: May-2023
Software Availability: Dec-2023

Platform Notes (Continued)

```
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


   ----------------------------------------------------------
19. OS release
   From /etc/*-release /etc/*-version
   os-release     Red Hat Enterprise Linux 9.2 (Plow)
   redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
   system-release Red Hat Enterprise Linux release 9.2 (Plow)


   ----------------------------------------------------------
20. Disk information
SPEC is set to: /mnt/ramdisk/cpu2017-1.1.9-ic2023.2.3
   Filesystem      Type   Size  Used Avail Use% Mounted on
   tmpfs           tmpfs  90G   5.1G  85G   6% /mnt/ramdisk


   ----------------------------------------------------------
21. /sys/devices/virtual/dmi/id
     Vendor:         Dell Inc.
     Product:        PowerEdge R960
     Product Family: PowerEdge
     Serial:         SLR9601


   ----------------------------------------------------------
22. dmidecode
   Additional information from dmidecode 3.3 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:
     31x 00AD063200AD HMCG94AEBRA109N 64 GB 2 rank 4800
     1x 00AD063200AD HMCG94MEBRA109N 64 GB 2 rank 4800



   ----------------------------------------------------------
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:      Dell Inc.
     BIOS Version:     1.6.6
     BIOS Date:        09/20/2023
     BIOS Revision:    1.6
```

Compiler Version Notes

```
==================================================================================================
C       | 502.gcc_r(peak)
--------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------


==================================================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
```

(Continued on next page)

Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

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Tested by: Dell Inc.

Test Date: Dec-2023
Hardware Availability: May-2023
Software Availability: Dec-2023

Compiler Version Notes (Continued)

```
         | 557.xz_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C        | 502.gcc_r(peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C        | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
         | 557.xz_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
Fortran | 548.exchange2_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifx`

Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`

(Continued on next page)

Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

SPECrate®2017_int_base = 640

SPECrate®2017_int_peak = 659

CPU2017 License: 6573   **Test Date:** Dec-2023
Test Sponsor: Dell Inc.   **Hardware Availability:** May-2023
Tested by: Dell Inc.   **Software Availability:** Dec-2023

Base Portability Flags (Continued)

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

Peak Compiler Invocation

C benchmarks:
```
icx
```

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

Fortran benchmarks:
```
ifx
```

Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

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CPU2017 License: 6573
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Dec-2023
Hardware Availability: May-2023
Software Availability: Dec-2023

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: `-w -std=c11 -m64 -Wl,-z,muldefs`
`-fprofile-generate`(pass 1)
`-fprofile-use=default.profdata`(pass 2) `-xCORE-AVX2`(pass 1)
`-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse`
`-funroll-loops -qopt-mem-layout-trans=4`
`-fno-strict-overflow`
`-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
`-lqkmalloc`

502.gcc_r: `-m32`
`-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/ia32_lin`
`-std=gnu89 -Wl,-z,muldefs -fprofile-generate`(pass 1)
`-fprofile-use=default.profdata`(pass 2) `-xCORE-AVX2`(pass 1)
`-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse`
`-funroll-loops -qopt-mem-layout-trans=4`
`-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc`

505.mcf_r: `basepeak = yes`

525.x264_r: `-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast`
`-ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -fno-alias`
`-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
`-lqkmalloc`

557.xz_r: `basepeak = yes`

C++ benchmarks:

(Continued on next page)

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

Dell Inc.

PowerEdge R960 (Intel Xeon Gold 6416H)

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CPU2017 License: 6573
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Test Date: Dec-2023
Hardware Availability: May-2023
Software Availability: Dec-2023

Peak Optimization Flags (Continued)

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/Intel-ic2023p2-official-linux64.html`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.6.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.xml`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-Xeon-v1.6.xml`

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

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