SPEC CPU®2017 Integer Rate Result

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Dell Inc.

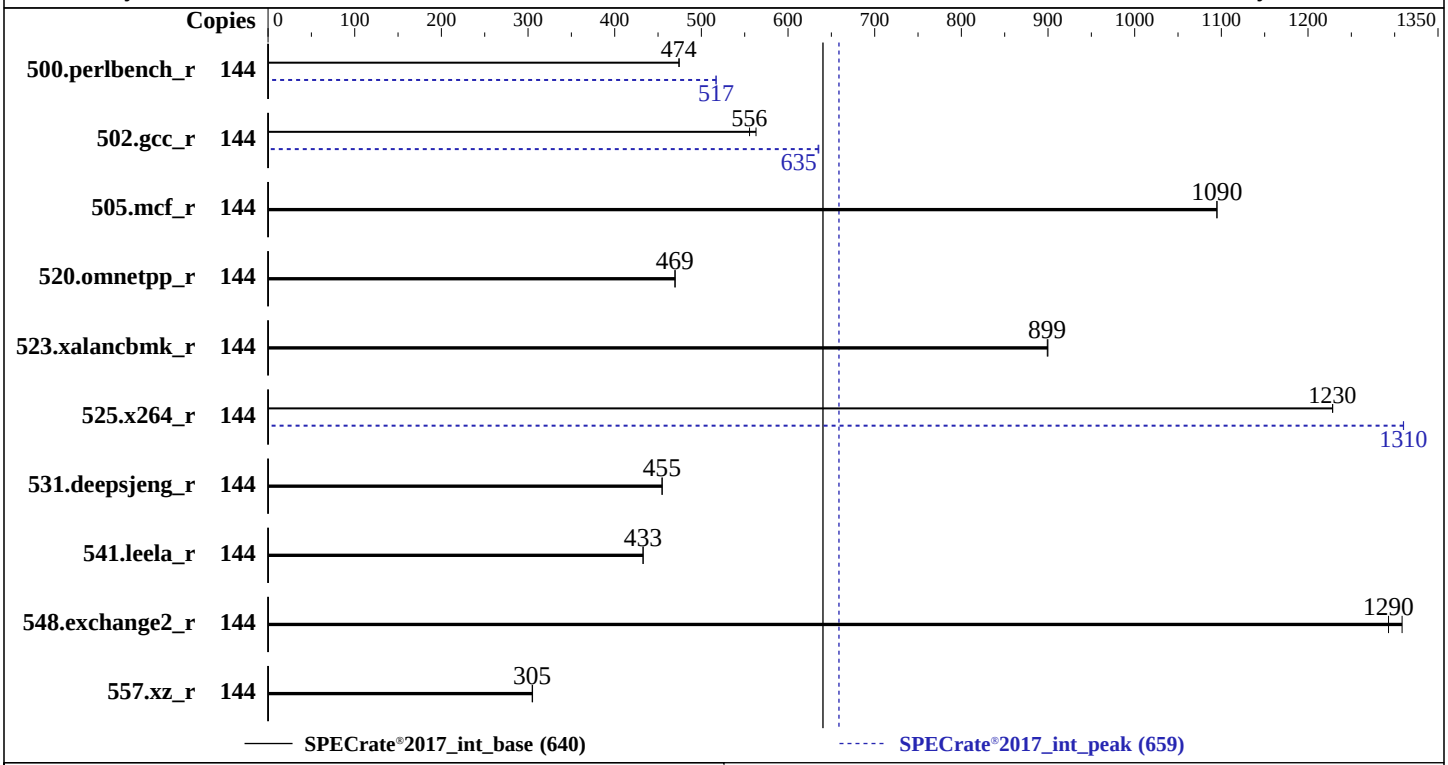
PowerEdge R960 (Intel Xeon Gold 6416H)

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



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.

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
```

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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
```

(Continued on next page)

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

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

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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)

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
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------------------------------------------------------------------------------------------------------------------------

==============================================================================================================
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
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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 2023.2.3 Build x
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==============================================================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
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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

(Continued on next page)

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`

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)

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`

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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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